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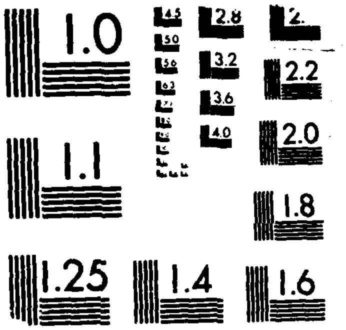


MICROCOPY RESOLUTION TEST CHART
BUREAU OF STANDARDS-1963-A

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The purpose of this Emergency Response Concept Plan is to present the conceptual basis for developing emergency response programs for the Chemical Stockpile Disposal Program. It presents a plan and general guidance for U.S. Army personnel, community groups and other involved local, state and federal agencies to follow in the subsequent development of such programs. The concepts presented are comprehensive in scope, but are not intended to represent definitive criteria for emergency program development. Rather this plan serves to identify important issues and key components of emergency response for chemical munitions accidents and to facilitate the interaction needed to build effective programs for public protection.

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# EMERGENCY RESPONSE CONCEPT PLAN FOR THE CHEMICAL STOCKPILE DISPOSAL PROGRAM

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## PURPOSE

The purpose of this Emergency Response Concept Plan is to present the conceptual basis for developing emergency response programs for the Chemical Stockpile Disposal Program. It presents a plan and general guidance for U.S. Army personnel, community groups and other involved local, state and federal agencies to follow in the subsequent development of such programs. The concepts presented are comprehensive in scope, but are not intended to represent definitive criteria for emergency program development. Rather this plan serves to identify important issues and key components of emergency response for chemical munitions accidents and to facilitate the interaction needed to build effective programs for public protection.

The Army is currently developing detailed standards and criteria to support site-specific planning and to ensure that the emergency response programs developed for each site are complete and consistent. These standards and criteria will be provided in draft form to all interested parties for review and comment before they are implemented. It is the intention of the Army to initiate early development of emergency response programs for each chemical stockpile storage site since such programs are needed regardless of the disposal alternative selected and for continued storage of the stockpile.

This plan represents an initial step in that process and may be revised as Army policy in this area is further defined and as community and other groups become more involved in structuring emergency response programs. It also contains an analysis of the different types of programs required for the various stockpile disposal alternatives, considers the relative effectiveness of such programs and will guide the development of an alternative-specific emergency response program when the stockpile disposal alternative is selected.

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APPENDICES



TABLES



FIGURES

## ACRONYMS

| | |
|---|---|
| ACh | Acetylcholine |
| AChE | Acetylcholinesterase |
| ANAD | Anniston Army Depot |
| APG | Aberdeen Proving Ground |
| ARC | American Red Cross |
| ARES | Amateur Radio Emergency Service |
| CAIRA | Chemical Accident/Incident Response and Assistance |
| CD | Civil Defense |
| CDC | Centers for Disease Control |
| CFM | Cubic Feet per Minute |
| CML | Conservative Most Likely |
| CRDEC | Chemical Research and Development Engineering Center |
| CSDP | Chemical Stockpile Disposal Program |
| dB | Decibels |
| dB(C) | Decibels (C scale) |
| DHHS | Department of Health and Human Services |
| DOD | Department of Defense |
| DPEIS | Draft Programmatic Environmental Impact Statement |
| D2PC | Army Computer Dispersion Model |
| EBS | Emergency Broadcast System |
| EMS | Emergency Medical Services |
| EOC | Emergency Operations Center |
| EOS | Emergency Operations Simulation |
| EPA | Environmental Protection Agency |
| EPZ | Emergency Planning Zone |
| ERCP | Emergency Response Concept Plan |
| FEMA | Federal Emergency Management Agency |
| FFE | Full Field Exercise |
| Hz | Hertz |

| | |
|---|---|
| IDLH | Immediately Dangerous to Life and Health |
| IDYNEV | Interactive Dynamic Evacuation Model |
| IEMIS | Integrated Emergency Management Information System |
| IP | Implementing Procedure |
| IRZ | Immediate Response Zone |
| LBAD | Lexington-Blue Grass Army Depot |
| MIEMSS | Maryland Institute for Emergency Medical Services Systems |
| MPC | Maximum Permissible Concentration |
| NAAP | Newport Army Ammunition Plant |
| NDO | National Disposal Option |
| ND | No Deaths |
| OS | On-Site Disposal Option |
| OSHA | Occupational Safety and Health Administration |
| PAO | Public Affairs Officer |
| PAR | Population at Risk |
| PAZ | Protective Action Zone |
| PBA | Pine Bluff Arsenal |
| PF | Protection Factor |
| PINS | Public Information Notification System |
| PIO | Public Information Officer |
| PUDA | Pueblo Depot Activity |
| RACES | Radio Amateur Civil Emergency Services |
| RDO | Regional Disposal Option |
| SOP | Standard Operating Procedure |
| STB | Super Tropical Bleach |
| TDD | Teletype Device for the Deaf |
| TEAD | Tooele Army Depot |
| TWA | Time Weighted Average |
| UMDA | Umatilla Depot Activity |
| WC | Worst Case |

# 1. PROBLEM DEFINITION AND CONCEPTUAL BASIS

## 1.1 INTRODUCTION

Title 14, Part B, Section 1412, of Public Law 99-145 directs the Department of Defense to destroy the United States stockpile of lethal chemical agents and munitions by September 30, 1994. This Emergency Response Concept Plan (ERCP) is a programmatic analysis of emergency preparedness implications related to the United States Army's Chemical Stockpile Disposal Program. As such, it is not intended to provide a detailed analysis of emergency preparedness measures on a site-specific basis. Rather, it identifies emergency preparedness issues which are common to the Chemical Stockpile Disposal Program, discusses alternative strategies through which to address them, and provides emergency response concepts which can be implemented to support the program.

The objective of this ERCP is to establish the concepts for the subsequent development of site-specific and alternative-specific emergency response programs. It addresses accidental chemical agent releases during all phases of the stockpile disposal program, under any of the disposal alternatives. The ERCP considers releases from the following activities: (1) storage; (2) on-site handling of material incidental to movement from storage to transportation loading dock or to an on-site disposal plant; (3) transport of chemical agents between shipping and receiving depots by rail convoy, by airlift and by surface water and (4) operation of lethal chemical disposal facilities.

The emergency response concepts discussed in this ERCP are presented from two principal standpoints. First are the fixed site aspects of the chemical stockpile disposal program that include all operations which will take place at the current stockpile storage locations. Secondly, emergency response concepts are discussed for the special additional considerations associated with each of the disposal alternatives involving off-site transportation of

chemical agent and the resultant potential for accidental chemical agent release in transit.

The Chemical Stockpile Disposal Program alternatives that are the basis for the concepts developed in this plan include: (1) on-site disposal of the chemical stockpiles at each of the eight stockpile storage sites; (2) collocation of the chemical stockpiles and disposal at a national disposal center at Tooele Army Depot, by rail transport; (3) collocation of the chemical stockpiles and disposal at two regional disposal centers at Tooele Army Depot and Anniston Army Depot, by rail transport; (4) limited collocation of the chemical stockpiles at Lexington-Blue Grass Army Depot and Aberdeen Proving Ground to Tooele Army Depot, by air transport; and, (5) collocation of the chemical stockpile at Aberdeen Proving Ground to Johnston Atoll, by water transport.

All reasonable and appropriate strategies for preventing chemical agent accidents will be employed during the chemical stockpile disposal program. Additional measures will be taken to prevent releases if accidents do occur. However, even with extensive mitigation programs, accidents can occur that place off-site populations at risk. The probability of most of these accidents is very small; the probability of accidents with severe off-site consequences is extremely small. Historically, emergency response planning for other hazards has been deemed appropriate for incidents with a frequency of occurrence of $10^{-6}$ to $10^{-8}$. Consequently, the planning base for this emergency response concept plan has been selected as those potential accidents with a frequency of $10^{-8}$ or higher.

A number of potential accident scenarios that could place off-site populations at risk have been identified in the hazard analyses for the various chemical stockpile disposal program alternatives. One of the types of accidents identified in the risk analysis that can have severe consequences for off-site areas involve aircraft crashes. An aircraft can crash into a storage igloo or warehouse, a disposal facility, a truck or convoy of trucks transporting chemical agents on-site, or a train or barge.

An aircraft transporting chemical agents can crash into a populated area. Other transportation modes also present accident potentials. Trains can derail both on-site and off-site, barges and ships can sink, and trucks may crash on-site, resulting in an off-site hazard. Earthquakes are another event which can result in severe accident scenarios. Earthquakes could result in releases from a storage facility or a demilitarization facility, or could cause accidents in chemical agent transportation. Munition handling accidents can occur during storage activities, preparation of munitions for transport, or during handling as part of the demilitarization process. Handling accidents generally result in less severe potential impacts. The impacts of various accidents on off-site areas can vary considerably, and depend upon the volume of agent released and its mode of release (source term), the meteorology prevailing at the time, distance from the release source and time available for response.

The emergency response concepts described in this plan represent a potential capability to mitigate the consequences of accidental releases of chemical agents. The potential to mitigate accident consequences through emergency response programs is not absolute for all accident scenarios nor is it equal across all of the disposal alternatives. Populations nearest to the stockpile storage locations are at greatest risk from chemical agent accidents and, for some accident scenarios, cannot be effectively protected from the lethal effects of chemical agent exposure. This concept plan recognizes the need for enhanced protection for near populations but the concepts presented do not represent complete protection for such populations. Emergency response programs can not be as effective in mitigating accidents that occur during the transportation of chemical agents as they can for accidents that occur on-site at a chemical stockpile storage site. The protective measures described in this ERCP and the accident assessment capabilities employed to determine the appropriate protective actions can provide information on the best measures for protection of the general population under various accident conditions, but cannot assure protection of every individual.

The following sections describe the properties of the chemical agents and their potential impacts on public health and the environment, the conceptual approach emergency response planning and the establishment of emergency planning zone concepts to support chemical accident response planning.

## 1.2 PROPERTIES OF CHEMICAL AGENTS

The agents of concern for this plan are the nerve agents GA, GB, and VX, and the vesicant agents H, HD, HT, and Lewisite. Properties that are important for emergency response and planning include 1) physical properties, that determine the agents' dispersion, distribution in various biological and environmental media, exposure routes, and permeation of protective materials; 2) chemical properties, that determine the agents' reactivity with water and other materials, behavior in fires, and persistence in the environment; and 3) toxicity, that determines the impact on humans and other receptors. These properties have been described in detail in the Draft Programmatic Environmental Impact Statement (DPEIS). They will be summarized here and discussed in relation to emergency response planning.

### 1.2.1 Physical and Chemical Properties

Physical and chemical properties of chemical agents are summarized in Table 1-1. All of the agents are liquids at normal indoor temperatures, although the mustards H, HD, and HT freeze at low ambient temperatures. HT has a lower melting point than HD, which freezes at 15°C and therefore cannot be poured at low ambient temperatures. The mustard agents have relatively high boiling points (217-225°C) but have significant vapor pressures at ambient temperatures. In the solid state at 0°C, H has a vapor pressure of 0.025 mm of Hg. which is 28 percent of the vapor pressure at 30°C. Therefore, mustards pose an inhalation hazard at higher ambient temperatures.

The nerve agents GA, GB, and VX are usually odorless, colorless, and tasteless. The high boiling points (low vapor pressure) of these nerve agents indicate that they will not dissipate immediately if spilled. The V agent (VX) is less volatile than the G agents, and is thus more likely to be absorbed through the skin; however, both agent types are sufficiently volatile to pose an inhalation hazard. For example, a person breathing air saturated with VX would attain the median lethal dosage ($LCt_{50}$), within a few minutes.

Table 1-1

Chemical and Physical Properties of Agents[a]

| Agent | Chemical Formula | Molecular Weight (Daltons) | Boiling Point (°C) | Melting Point (°C) | Vapor Pressure At 20°C (mm Hg) |
|---|---|---|---|---|---|
| H | $C_4H_8Cl_2S$ | 175 | 225 | 5 to 14 | 0.059 |
| HD | $C_4H_8Cl_2S$ | 159 | 217 | 14 | 0.072 |
| HT | b | (HD = 159)[b] (T = 263)[b] | 228 | 0 | 0.079 |
| GB | $C_4H_{10}FO_2P$ | 140 | 158 | -56 | 2.2 (25°C) |
| VX | $C_{11}H_{26}NO_2PS$ | 267 | 300 | -39 | 0.00066 |
| GA | $(CH_3)_2NP(O)-(C_2H_5O)(CN)$ | 162 | 240 | -50 | 0.07 (25°C) |
| L | $Cl_2$ As CHCHCl | 207 | 190 | -18 | 0.394 |

a Table adapted from:
National Research Council 1984. Disposal of Chemical Munitions and Agents. Report prepared by the Committee on Demilitarizing Chemical Munitions and Agents, Board on Army Science and Technology, Commission on Engineering and Technical Systems, National Research Council, National Academy Press, Washington, DC.

b HT is a mixture of 60% H and 40% T; $C_8H_{16}Cl_2OS_2$.
T is known as bis [2 (2-Chloroethylthio) ethyl] ether.

The mustard agents are only slightly soluble in water but can undergo hydrolysis in water. The nerve agents are miscible in water, but their lipid solubility allows them to be easily absorbed by most exposure routes. Nerve agents are acidic and hydrolyze in water.

Accidental releases of these agents during fires or explosion could expose on-site personnel and the general public to combustion products as well as uncombusted agents. Fire involving H, HD, HT, and Lewisite would produce toxic combustion products, including $Cl_2$, HCl, $H_2SO_4$, $SO_2$ (H, HD, and HT) and chlorovinyl arsenous oxide (Lewisite). GA may produce hydrogen cyanide (HCN) on combustion, while VX produces phosphoric acid ($H_3PO_4$), $SO_2$, and sulfuric acid ($H_2SO_4$).

Persistence of chemical agents in the environment varies with the agent, the environmental medium, and other conditions such as pH, volatility, and temperature. Relative persistence data is summarized in Table 1-2. Both blister agents (H, HD, HT and Lewisite) and the nerve agent VX persist in soils, although the reported persistence varies. Nerve agents GA and GB degrade over a relatively short period of time.

Mustard agent can permeate ordinary rubber and may permeate other protective materials. The persistence of these agents in water, and also their formation of toxic decomposition products, pose a potential threat of drinking water contamination following an accident.

### 1.2.2 Toxicity

The agents GA, GB, and VX are rapidly acting, lethal nerve agents. They directly affect the nervous system, and are toxic in both liquid and vapor forms. The agents are organophosphorus esters that inhibit acetylcholinesterase (AChE), an enzyme that prevents the accumulation of the neurotransmitter acetylcholine (ACh) at the nerve synaptic junction. When AChE is inhibited and ACh accumulates, the results are convulsion and death.

Table 1-2

Relative Persistence of Chemical Agents [a]

| Agent | Soil | Water | Seawater | Snow |
|---|---|---|---|---|
| H/HD | Depending on type of soil, pH, and moisture content, weeks to years | In approx. 1 hr. (25°C) decomposition product as toxic as H. About twice as persistent in seawater | | Approx. 2 weeks[b] |
| HT | Persistent | Permeates ordinary rubber solubility | | Persistent due to poor |
| L | Intermediate persistency | Intermediate persistency due to slight solubility | | |
| | | Water[c] | Seawater[c] | |
| GA | Approximate half-life 1 to 1 1/2 days | 5°C 140 hrs<br>15°C 42 hrs<br>20°C 22 hrs<br>25°C 14-28 hrs | 5°C 213 hrs<br>15°C 79 hrs<br>20°C 45 hrs<br>25°C 29 hrs | Appox. 2 weeks[b] |
| GB | At temperatures between 5-25°C, persists for 2.5 to 24 hrs; in some soils GB may persist for as long as 5 days | 5°C 90 hrs<br>15°C 25 hrs<br>25°C 8 hrs | 5°C 12500-125 hrs<br>15°C 3000-30 hrs<br>25°C 750-7.5 hrs | Greater than 4 weeks[b] |
| VX | Relatively persistent, 2 to 6 days | Not readily soluble. Toxic hydrolysis products form at pH's between 7 and 10 | | Greater than 4 weeks[b] |

a From U.S. Dept. of the Army 1974. "Chemical Agent Data Sheets, Vol. 1," in Technical Report # EO-SR-74001 (Edgewood Arsenal Special Report), Defense Technical Information Center, Alexandria, VA.

b Johnsen, B.A. and J. H. Blanch "Analysis of snow samples contaminated with chemical warfare agents" Arch. Belg. Med. Soc., Hyg., Med. Trav. Med. Leg.: ISS Proc-World Congr. New Compound Biol. Chem. Warfare: Toxicol. Eval. 1st, 1984, 22-30.

c pH dependent

The severity of symptoms of acute exposure to the nerve agents is dependent on the quantity and dose rate of the exposure. Symptoms may include tightness of the chest, pinpointing of the pupils of the eyes (miosis), breathing difficulties, drooling and excessive sweating, nausea, vomiting, cramps, twitching and staggering, headache and convulsion, followed by cessation of breathing, and death.[1] Characteristics of both acute and chronic toxicity of the nerve agents are outlined in Table 1-3. Specific toxic concentrations of each of the nerve agents are listed in Table B-6 of the DPEIS.

The agents H, HD, HT, and L are vesicant agents, which injure the eyes, damage the lungs, and severely blister the skin upon exposure. The vesicants can often react with tissue constituents, and there is significant evidence that exposure may result in carcinogenesis[2]. The vesicant agents are effective in minute quantities, and produce delayed (up to 15 hours) casualties. Detailed information on acute and chronic toxicity of the vesicant agents is listed in Table 1-3. Specific acute toxic affects are listed in Table B-2 of the DPEIS.

### 1.2.3 Public Health Impacts

If chemical agents are released accidentally, severe human health effects could result. The magnitude of the impact depends on a number of variables, including the amount and type of agent released, the type of release (e.g., spill, explosion, etc.), meteorological conditions, the number of unprotected people exposed to the agent(s), distance from the accident site to unprotected individuals, age, gender, health of populations, route and duration of exposure, and timely administration of medical treatment.

The Army's Gaussian-plume dispersion model, D2PC, has been used to predict the areas affected by accidental releases of chemical agents and can be used to establish emergency planning zones (EPZs), as discussed in Section 2.0. The model predicts areas affected by time-weighted average (TWA) concentrations likely to produce fatalities. The D2PC code incorporates

Table 1-3

Chemical Agents and Biological/Physical Characteristics Relevant to Their Toxic Activity[a]

| Chemical Agent | Chemical Name | Mode of Action | Special Characteristics: Acute Toxicity | Special Characteristics: Chronic Toxicity |
|---|---|---|---|---|
| GA (tabun) | Phosphoramidocyanidic acid, dimethyl-, ethyl ester | Nerve agent | Less volatile, more persistent than GB<br>Less toxic than GB by vapor inhalation; equally toxic by skin absorption (liquid)<br>More effective than GB in producing miosis (pinpointing of eye pupil)<br>GB is 2-4 times as effective in terms of incapacitating dose | No information; Army has studies planned |
| GB (sarin) | Phosphonofluoridic acid, methyl-, isopropyl ester | Nerve agent | Volatile, therefore poses less of a threat by absorption through the skin, either as aerosol or liquid, than it does by inhalation<br>About half as toxic as VX by inhalation<br>Less effective than GA or VX in inducing miosis | Some information at present; studies in progress<br>Low does study did not show carcinogenic activity<br>Teratogenicity study negative; other reproductive parameters were unaffected<br>Potential for a delayed neuropathy syndrome, at high (supralethal) doses, if protection from acute lethality is achieved by drugs<br>Changes in EEG recordings after exposure; consequences unknown |

Table 1-3

Chemical Agents and Biological/Physical Characteristics Relevant to Their Toxic Activity (Cont.)[a]

| Chemical Agent | Chemical Name | Mode of Action | Special Characteristics: Acute Toxicity | Special Characteristics: Chronic Toxicity |
|---|---|---|---|---|
| VX | Phosphonothioic acid, methyl-, S- [2-(di-isopropylamino)ethyl] O- ethyl ester | Nerve agent | Less volatile than G agents; very effective through skin penetration; also persistent<br>Many-fold times as toxic in man as GB, after skin administration<br>Head and neck areas of man very sensitive to VX penetration<br>Effective percutaneous lethal does decreases with increasing windspeed<br>Contaminated vegetation can cause toxicity upon ingestion<br>VX is 25 times more potent than GB in inducing miosis | Mutagenicity studies were negative<br>Teratogenicity studies were negative; other reproductive studies in progress<br>Inactive delayed neuropathy induction<br>Carcinogenic activity unknown |
| H/HD Mustard gas, Sulfur mustard | Bis (2-chlorethyl) sulfide | Blister agent | Low volatility; very persistent on earth and solid surfaces<br>Produces skin blisters, damage to eyes and respiratory tract | Carcinogenic under appropriate conditions of exposure<br>Potential increased risk of chronic bronchitis after exposures |
| HT | 60% HD, 40% T | Blister agent | Less volatile and more stable than HD<br>More toxicologically active than HD | Probably carcinogenic and mutagenic due to presence of HD |

Table 1-3

Chemical Agents and Biological/Physical Characteristics Relevant to Their Toxic Activity (Cont.)[a]

| Chemical Agent | Chemical Name | Mode of Action | Special Characteristics: Acute Toxicity | Special Characteristics: Chronic Toxicity |
|---|---|---|---|---|
| T | Bis [2 (2-chloroethylthio) ethyl] ether | | 1% lethality dosage is half that of HD<br>HT more toxicologically active than HD for skin blister development and inhalation lethality<br>Very persistent on terrain<br>Eye is most sensitive; exposures can result in permanent eye damage | T is strongly mutagenic<br>No experimental information on HT |
| L<br>Lewisite | Dichloro (2-chlorovinyl) arsine | Blister agent | Much greater volatility than HD, hence is an irritant over great distances<br>Intermediate persistency in soils<br>Skin burns more corrosive than HD<br>Similar to HD upon inhalation<br>Eye very sensitive, permanent blindness may result if not decontaminated in 1 min.<br>A systemic poison when absorbed by tissues (liver and Kidneys)<br>Immediate severe pain upon contact with skin or eyes | Mutagenicity experiments were negative; other experiments are planned<br>Possible carcionogenic properties<br>Teratogenic potential suspected<br>Teratogenesis and reproductive toxicity studies planned |

[a] From: U.S. Army, 1986. Chemical Stockpile Disposal Program Draft Programmatic Environmental Impact Statement, p. 4-37.

extensive chemical agent source-term information as well as characteristics of the various chemical agents, including the one percent lethality ($LC_1$) and no-death doses ($LC_0$) (see Table 1-4). The reliability of these parameters is thus critical to the determination of the no-death distance by the model.

Table 1-4
No-Death Doses of Chemical Agents[a]

| Agent | No Death Dose (mg-min/m$^3$) D2PC Figure | No Death Dose (mg-min/m$^3$) 20% Factor |
|---|---|---|
| H, HD | 100 | 20 |
| HT | 50 | 12.5 |
| L | 100 | 20 |
| L | 10[b] | 2 |
| GA | 12 | 2.4 |
| GB | 6 | 1.2 |
| VX | 2 | 0.4 |

a All values obtained from U.S. Army D2PC Dispersion Program.
b Value obtained from U.S. Army, 1974.

The dose-rate values in the D2PC code are based on the assumption that the majority of the dose is absorbed by inhalation and that the individuals exposed are wearing clothing. In the case of VX, the lethality estimates ($LCt_{50}$) for human percutaneous exposure change dramatically as a function of amount of clothing worn and wind speed. The no-death distances predicted by the D2PC may not be appropriate for a non-combat civilian population. Although the majority of the potentially exposed population would not be expected to be unclothed, many individuals would be expected to have

portions of their bodies exposed. The D2PC code is also based on exposure to healthy young males. Certain members of the population may be more susceptible to agent exposure, e.g. infants, the elderly, and debilitated individuals. Therefore, an overall scaling factor of 20 percent has been applied to the D2PC no-deaths atmospheric concentrations for each agent (See Table 1-4). This factor was applied to the D2PC values, to account for sensitive subpopulations such as infants, the elderly, and previously debilitated individuals. The factor allows for a more conservative approach for the establishment of emergency planning zones (see Table 1-4).

### 1.2.4 Environmental Impacts

In addition to the concern for acute and chronic human health effects, emergency response planning must consider environmental impacts, and impacts to drinking water sources, food supplies and other natural resources. Additionally, environmental contamination is an important determinant of reentry.

The data on persistence of chemical agents (Table 1-2) clearly indicates the need for concern about potential effects on water supply. In addition to the potential for water contamination from the primary agents, there is also potential for contamination by toxic decomposition products. Contamination of surface water bodies used as public water supplies would be of immediate concern. Ground water supplies could also be affected if the agents migrate into the subsurface.

Contamination of land surfaces with chemical agents poses a threat of food chain contamination and bioaccumulation as well as serving as a direct pathway of exposure to humans and higher animals. Additionally, VX can be absorbed in undegraded forms by plants (U.S. Army, 1986). Toxicity to animals can be expected from ingestion of food items contaminated with the chemical agents.

It may be difficult to predict reentry times with the limited data on persistence and environmental distribution. Monitoring of the affected areas for presence of the agents will be necessary to permit decisions on reentry.

### 1.2.5 References

1. Defense Technical Information Center, 1974. Chemical Agent Data Sheets, Volume I. Edgewood Arsenal Special Report, EO-SR-74001, 183 pp.

## 1.3 CONCEPTUAL APPROACH

A comprehensive emergency response program must be implemented at each of the stockpile storage locations for any of the disposal alternatives selected, or for continued storage of the stockpile. The presence of the stockpile presents risks to the public that necessitate an emergency response program for each site until the chemical agent is removed by either demilitarization or transportation. For the national, regional and limited collocation disposal alternatives, a fixed site emergency response program is still necessary at each shipping and receiving point until the stockpiles are completely removed from a site or are destroyed. Those disposal alternatives involving transportation of chemical agents pose additional requirements for emergency response to accidents that could occur in transit and involve unique considerations over and above the fixed-site program requirements for the eight stockpile locations. Emergency response concepts for each of the alternatives involving transportation are considered independently and additional requirements unique to each alternative presented. The fixed-site emergency response concepts warrant primary attention in that they not only apply to all of the disposal alternatives considered, but also apply to the present and continued storage of chemical agent at the eight storage depots.

During the development of this ERCP, assessments of the existing emergency response programs at the eight depots were conducted, focusing largely on community emergency response capabilities and the Army's organization and procedures for coordination of emergency response activities with community agencies. These assessments point out a number of general emergency response program components that must be developed or improved. Such program improvements must be quickly implemented and need not await initiation of a record of decision on the chemical stockpile disposal program. The fixed-site emergency response concepts presented in this ERCP are a more detailed development of the general comments contained in the individual site assessments and should be used as the conceptual basis for development of site-specific emergency response programs, regardless of the disposal option or options which are selected.

The fixed-site emergency response program must establish an adequate level of preparedness in all of the component areas of emergency response, which are detailed in Section 3 of this ERCP. This program will involve cooperative interaction between the U.S. Army and the appropriate governmental authorities in the areas surrounding each of the storage depots. It must provide for the organization, relationships, procedures and systems that will support effective management of emergency response for any potential accident occurrence. This emergency response management function includes appropriate communication, command and control structures to support timely and effective assessment of accidents, as well as cooperative decision-making on the protective actions to be implemented for protection of the public potentially affected by an accident.

The most appropriate protective action(s) for public protection must be analyzed on a site-specific basis. The principal protective action options described in this ERCP will be applied selectively to ensure that the proper equipment, supplies, shelter enhancements, information and training needed for each site are identified and implemented. Site specific plans will also identify the special populations and institutions which require unique assistance or protection and the appropriate support mechanism to be established. An important component of each site-specific program is a public alert and notification system capable of alerting and providing emergency instructions to the public in the event of an accident, with special consideration given to the public in closest proximity to the depot. The full range of response mechanisms for timely and effective public protection will be established for each site.

The resources required to implement the emergency response plans will be identified from within the U.S. Army, the local communities, and other local, state and federal agencies which have a role in emergency response. Agreements must be coordinated in advance with all applicable groups and agencies. These agreements will include resources for transportation, emergency medical services, mass care, security, protective equipment and other resources to support the full range of potential emergency responses.

A public information program will also be instituted to ensure that community residents understand the programs established for their protection and are prepared to react appropriately in the event of an accident. A training program for emergency response personnel, and operational exercises, will be established and repeated regularly to ensure that all of the provisions of the emergency response program can be effectively implemented at any time during the chemical stockpile storage and disposal process.

Those disposal alternatives that involve transportation of chemical agents include: 1) the movement of chemical agents by rail for the regional and national disposal alternatives; 2) the movement of chemical agents by air for collocation of the stockpiles at Lexington-Blue Grass Army Depot and Aberdeen Proving Ground to Tooele Army Depot; and 3) movement by water for collocation of the Aberdeen Proving Ground stockpile to Johnston Atoll. These disposal alternatives pose unique additional requirements for alternative-specific emergency response programs for the principal transportation modes (rail, air and water). Although the regional and national disposal alternatives are separate and distinct disposal alternatives, the emergency response concepts that apply to each are essentially the same and they are considered together under the rail transportation emergency response concepts.

The principal additional, or special, considerations associated with the disposal alternatives involving transportation are related to the potential for accidental release of chemical agents in transit. Since on-site storage and disposal activities involve fixed and defined sites, emergency response programs will be quite detailed and specific for the geographical area that can predictably be impacted by an accident. In the case of the transportation alternatives, the potential area of impact is substantially undefined and it is not possible to have advance knowledge of the precise location of an accident. In the case of movement of chemical agents by air from Lexington-Blue Grass Army Depot and Aberdeen Proving Ground to Tooele Army Depot, however, it is possible to identify an area of high risk. This high risk area defines an extended zone at either end of the runway at these

depots and at emergency landing sites as a definable area for which detailed and specific emergency response planning is practical. For accidents in transit outside of the departure and landing zones for the air transport alternatives, and for the other transportation alternatives, emergency response concepts must be based upon mobile and/or broad-area capabilities for response to accidents.

The emergency response concepts for fixed sites are based upon the feasibility of detailed site-specific planning. It is not practical to develop such detailed planning for the transportation corridors as there is such a broad area defined by the transportation corridors of the various transportation alternatives. For this reason, emergency response concepts for accidental chemical agent releases in transit must be of a more general nature, and must be based either on transporting the appropriate emergency response capability with the stockpile transport, or establishing a broad-area response capability organized at the state-level or regionally for the various corridors. The emergency response programs developed for in-transit accidents cannot be as responsive or as complete as those for fixed sites because of the expansive areas involved and the inability to pinpoint the specific location of an accident prior to occurrence. Thus the same level of mitigation can not be provided for in-transit accidents.

The establishment of a mobile emergency response capability for public protection is appropriate for those alternatives involving rail transportation. An escort train that will accompany the munition train contains a variety of response capabilities. These capabilities can not equal, however, the level of preparedness implemented for fixed sites because of the limitations associated with a mobile versus a fixed capability. A state-level and regional coordination system will be established to support the mobile capability but will primarily be effective for secondary responses.

Water transportation of mustard agent from Aberdeen Proving Ground through the Chesapeake Bay and ocean routes to Johnston Atoll will also involve a limited mobile response capability aboard an escort ship for response to

accidents occurring during transport, principally for protection of transport personnel. Since this limited collocation alternative will be a one time shipment, the most practical and effective on-shore response capability is a mobile response capability that will travel with the shipment through the Chesapeake Bay area on both shores, coupled with limited planning for the corridor area. The movement will be closely coordinated with state and local authorities in the corridor, but will be supported principally by U.S. Army response teams that will move through the potentially affected land areas as the shipment moves down the Chesapeake Bay to the ocean.

The limited collocation of the Lexington-Blue Grass and Aberdeen Proving Ground stockpiles by air to Tooele Army Depot cannot be effectively supported by a mobile response capability. It would be logistically impractical to move sufficient emergency response resources by air, along with the air shipments, to provide response capabilities at a crash site, should there be an accident in transit. An alternative approach could involve land based response capabilities stationed at established distances along the air transport route. It is likely that such a response capability would not be effective for primary response as it could potentially take an extended period of time to locate and reach a crash site. Emergency landing sites will be designated for air transportation routes and fixed emergency response capabilities will be established at these locations as definable potential accident sites, as well as at the origin and destination fixed sites.

Each of the disposal alternatives involving transportation of chemical agents poses unique emergency response planning situations. Programs will be established for each alternative that can potentially mitigate the effects of an accident. However, because of the large geographical areas potentially affected by an accident in transit, the emergency response programs cannot be as effective as for a fixed, defined site. In some cases, emergency response programs may not mitigate the effects of chemical agent accidents in transit. In nearly all cases, emergency responses for

in-transit accidents cannot provide a degree of protection which is comparable to that for fixed sites. It should be recognized, however, that emergency landing sites may pose increased risk in that they are designated for use when an aircraft is damaged or otherwise distressed or when munitions leaks occur in transit.

## 1.4 EMERGENCY PLANNING ZONE CONCEPTS

Emergency Planning Zone (EPZ) concepts have been developed to support the development of fixed site and transportation alternative emergency response concepts. Before detailed site-specific or alternative-specific emergency response planning can be established, it is necessary to determine the geographical areas potentially affected so that emergency response program needs can be analyzed for those areas. The EPZ's establish the boundaries within which the emergency response concepts will be applied. The EPZ's are defined generically within this section for the eight sites and generally for the transportation alternatives. They are developed in consideration of the risk analyses that have been performed for the chemical stockpile disposal program and are based largely on time/distance considerations that recognize the potential rapid onset of an accidental release of agent and the limited amount of time that may be available for warning and response actions. They also recognize the importance of comprehensive emergency response planning and support systems for rapidly occurring events and the criticality of such programs in those areas nearest to the release point.

The EPZ's described in this section are intended to guide the development of emergency response concepts and, subsequently, the development of site-specific and alternative-specific emergency response programs. They should not, however, be applied inflexibly to a particular site or alternative or to a specific accident scenario. The development of actual site-specific or alternative-specific EPZ's should be done in recognition of the unique political and geographical characteristics of each site and for each alternative. Although the general EPZ dimensions should be applied consistently across the program, specific configurations may vary from site to site, or with each transportation alternative, to most appropriately define the planning boundaries for each situation.

In order for an emergency response program to be effective, the principal concepts that are the basis for the program must be relatively simple. This allows for decisive and effective decision-making by emergency program

managers and also assures public recognition and understanding of recommended actions for self-protection. The definition of EPZ's is a critical element in decision-making and response and, therefore, should be performed to most clearly identify the areas of potential impact. The use of easily recognizable political boundaries, geographic characteristics such as rivers and streams, highways, roads and other landmarks in defining EPZ's will most effectively support emergency response program implementation.

In the case of fixed sites, EPZ's are established for three separate areas to accommodate the varying levels of preparedness appropriate at various distances from the stockpile locations. These zones are defined as a series of concentric boundaries that represent various degrees of hazard or risk posed by accidental release of chemical agents. In the case of the rail and water transportation alternatives, the EPZ's are defined as planning corridors for land areas affected along the designated transportation routes, as well as fixed, circular EPZ's at the point where an agent release takes place. In the case of air transportation, EPZ's are defined for the shipping and receiving locations, as well as for designated emergency landing sites. The three planning zones for fixed-site emergency response planning and EPZ considerations for each of the transportation alternatives are described in the following sections.

### 1.4.1 Protective Action Zone

The Protective Action Zone (PAZ) is an area defined by a circle of approximately 35 km in radius around a typical fixed site. The PAZ is established as an area where public protective actions may be necessary in the event of an accidental release of nerve agent and for which comprehensive emergency planning and response mechanisms can significantly enhance the ability to protect public health and safety.

The 35 km distance was selected as the outer boundary for protective action planning because it represents an approximate distance past which substantial warning and response time is available to implement protective

actions without highly detailed local emergency response planning. The 35 km distance also represents the maximum no-death distance for worst-case accidents involving nerve agent releases under the on-site disposal, regional and national disposal alternatives for most sites. For those cases where worst-case accidents under the chemical demilitarization program may have lethal effects beyond 35 km (as well as for worst-case continued storage accidents which may also have lethal effects beyond 35 km) it is concluded that sufficient warning and response times are available to preclude the need for detailed local emergency response planning past 35 km.

The worst-case meteorological conditions that are the basis for the risk analyses' predictions of down-wind impacts include a wind speed of 1 m/sec (meter per second). At that wind speed the time required for a chemical agent release to reach a distance of 35 km from the stockpile location is nearly 10 hours. This represents a substantial and sufficient time frame to implement appropriate protective actions beyond 35 km without comprehensive and detailed local planning efforts. With conservative most likely (CML) meteorological conditions, which include a wind speed of 3 m/sec, the time required for a chemical agent release to reach 35 km is slightly more than three hours. However, under CML meteorological conditions, substantially greater dispersion takes place and the maximum no-death distance for most accidents would be substantially less than 35 km. It is prudent to plan various precautionary actions outside of 35 km for all disposal alternatives based upon state or regionally coordinated wide area information dissemination mechanisms.

A 35 km PAZ, for which detailed emergency response programs and systems are developed, is considered to be an appropriate basis for fixed site emergency response planning. The full range of programs and support mechanisms described in the Emergency Response Concepts section of this plan apply within the PAZ. In addition, precautionary measures should be considered for areas beyond a 35 km distance from the storage/disposal sites. Given the likelihood of substantial warning and response times for areas beyond 35 km, precautionary measures can be planned and implemented at a state or

regional level. An EPZ designated as the Precautionary Zone is established for this purpose. Within the PAZ those areas nearest to the stockpile locations must be given special consideration because of the potentially very limited warning and response times available within those areas. An Immediate Response Zone is defined, within the PAZ, to allow for the development of emergency response concepts that are appropriate for immediate response in areas nearest to the site. These three fixed-site emergency planning zones are graphically shown in Figure 1-1. The Precautionary Zone and Immediate Response Zone are conceptually described in the following sections.

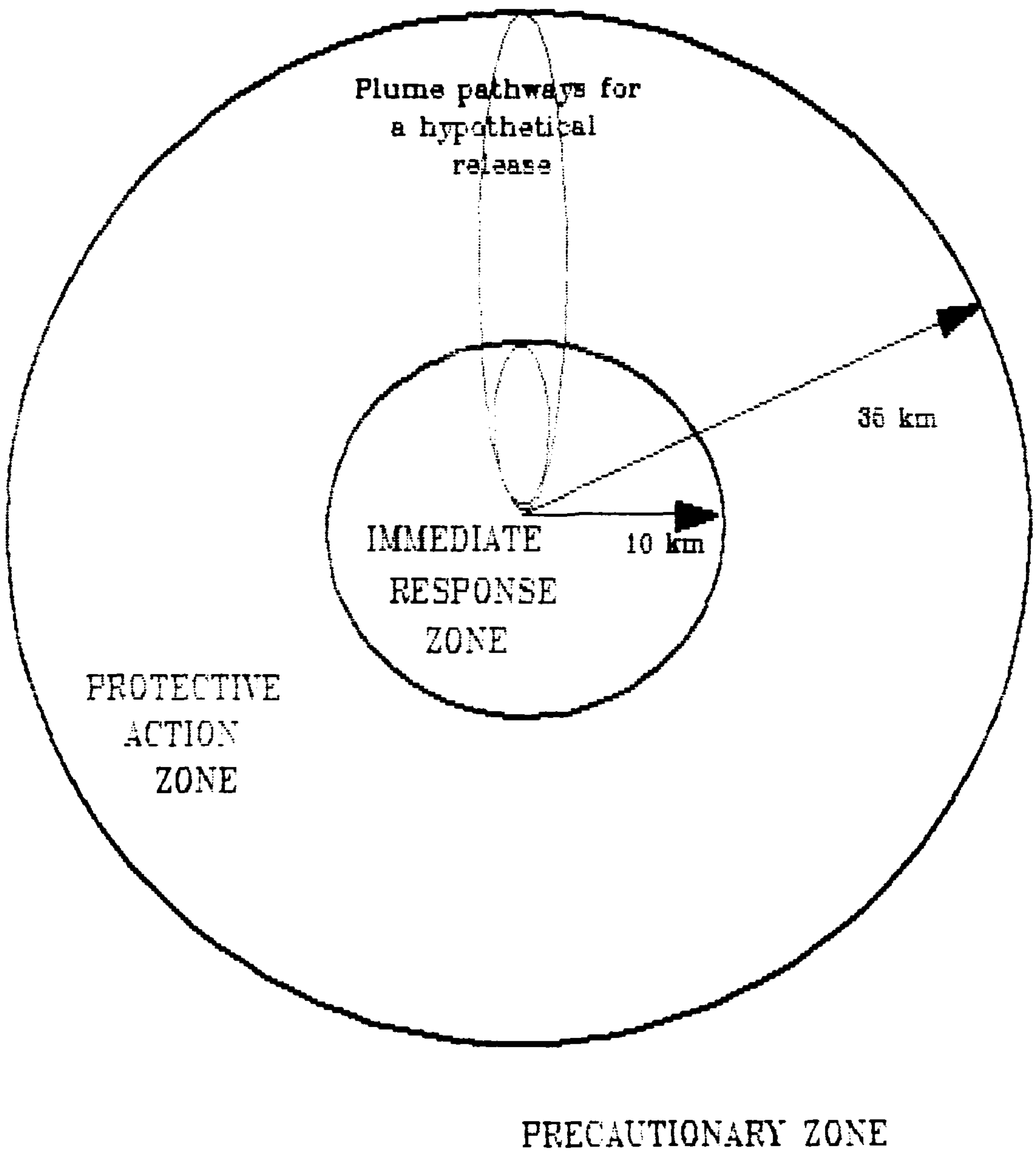
It should be noted that this guidance is programmatic in nature and must be formalized on a site-specific basis. Certain sites may merit substantially different EPZ's due to the nature of the chemical agents in their stockpile. For example, APG and PUDA currently store only mustard agents; a significantly smaller PAZ may be appropriate for such installations. The site specific EPZs must be developed based on site specific risk analyses and other local factors.

### 1.4.2 Immediate Response Zone

The Immediate Response Zone (IRZ) is defined as an area within the PAZ for which prompt and effective response is most critical, due to the potentially limited warning and response time available in the event of an accidental release of chemical agent. The IRZ extends to a distance of approximately 10 km from the storage/disposal site. This area would encompass the no-death distance for most accidents under CML meteorological conditions, and would have less than one hour response time under those conditions. It is this area that would most likely be impacted by an accidental release of chemical agent and would be impacted within the shortest period of time and with the heaviest concentrations. For these reasons, emergency response concepts should be developed which are specific to the IRZ to provide for the most appropriate and effective response within this area.

# Figure 1-1

## EMERGENCY PLANNING ZONE CONCEPTS FOR CHEMICAL AGENT RELEASES



The full range of appropriate and available protective action options and response mechanisms should be considered for the IRZ. The principal protective actions (sheltering and evacuation) must be considered carefully, along with supplemental protective action options that can significantly enhance the protection of public health and safety. Generally, sheltering may be the most effective principal protective action for part or all of the IRZ because of the potentially short period of time before impact by a release, particularly for those areas within the IRZ nearest to the release point. In this instance, the time may not be available to complete an evacuation of certain areas. The suitability of sheltering, however, is dependent upon a number of other factors including the type(s) and concentration(s) of agent(s), expedient or pre-emergency measures taken to enhance various buildings' capacity to inhibit agent infiltration, the availability of individual protective devices for the general public, the accuracy with which the particular area, time and duration of impact can be projected, and the ability to communicate instructions to the public in a timely and effective fashion.

The capability to rapidly implement the most appropriate protective action(s) is critical within the IRZ. A thorough analysis of the IRZ specific to each storage/stockpile location must be conducted and a precise methodology for determining the appropriate protective action(s) under various accident scenarios established, to ensure that a minimum of decision-making is required at the time of a chemical agent release. This analysis will likely identify certain areas within the IRZ which would implement sheltering under most accident scenarios, with evacuation only available as a precautionary measure. Subzone areas may be defined to accommodate the selective implementation of different protective actions within portions of the IRZ. Given a reasonably effective capability to project the area of impact and predict levels of impact at the time of a release, it may be appropriate to implement sheltering in areas close to the release point within the plume and evacuate areas not immediately impacted. As the emergency progresses past the initial response phase, the IRZ becomes less critical as actions are focused on other areas and aspects of response.

### 1.4.3 Precautionary Zone

The Precautionary Zone is the outermost emergency planning zone and extends to a distance where no adverse impacts to humans would be experienced in the case of a maximum potential release under CML meteorological conditions. This distance may vary substantially based upon the circumstances of an accident occurrence and would be determined on an accident specific basis. For this emergency planning zone the protective action considerations are limited to precuationary protective actions, and taking actions to mitigate the potential for food-chain contamination as a result of an agent release.

Sheltering as a protective action in this emergency planning zone is largely a precautionary protective action to reduce the potential for exposure to non-lethal concentrations of chemical agent. Evacuation could also be implemented as a precautionary protective action in this emergency planning zone. The means for implementing the agricultural protection and other precautionary activities appropriate in this emergency planning zone can be based principally on broad-area dissemination of emergency public information at the time of an accidental release of agent. Because of the substantial warning and response time available for implementation of response actions in the Precautionary Zone, detailed local emergency response planning is not required.

### 1.4.4 Emergency Planning Zone - Rail Transportation

The emergency response concepts for the disposal alternatives involving transportation of chemical agent by rail include a mobile emergency response capability which will be transported with the rail shipments and a regional response capability, coordinated principally at the state level, which will monitor chemical agent shipments and coordinate the implementation of secondary response activities.

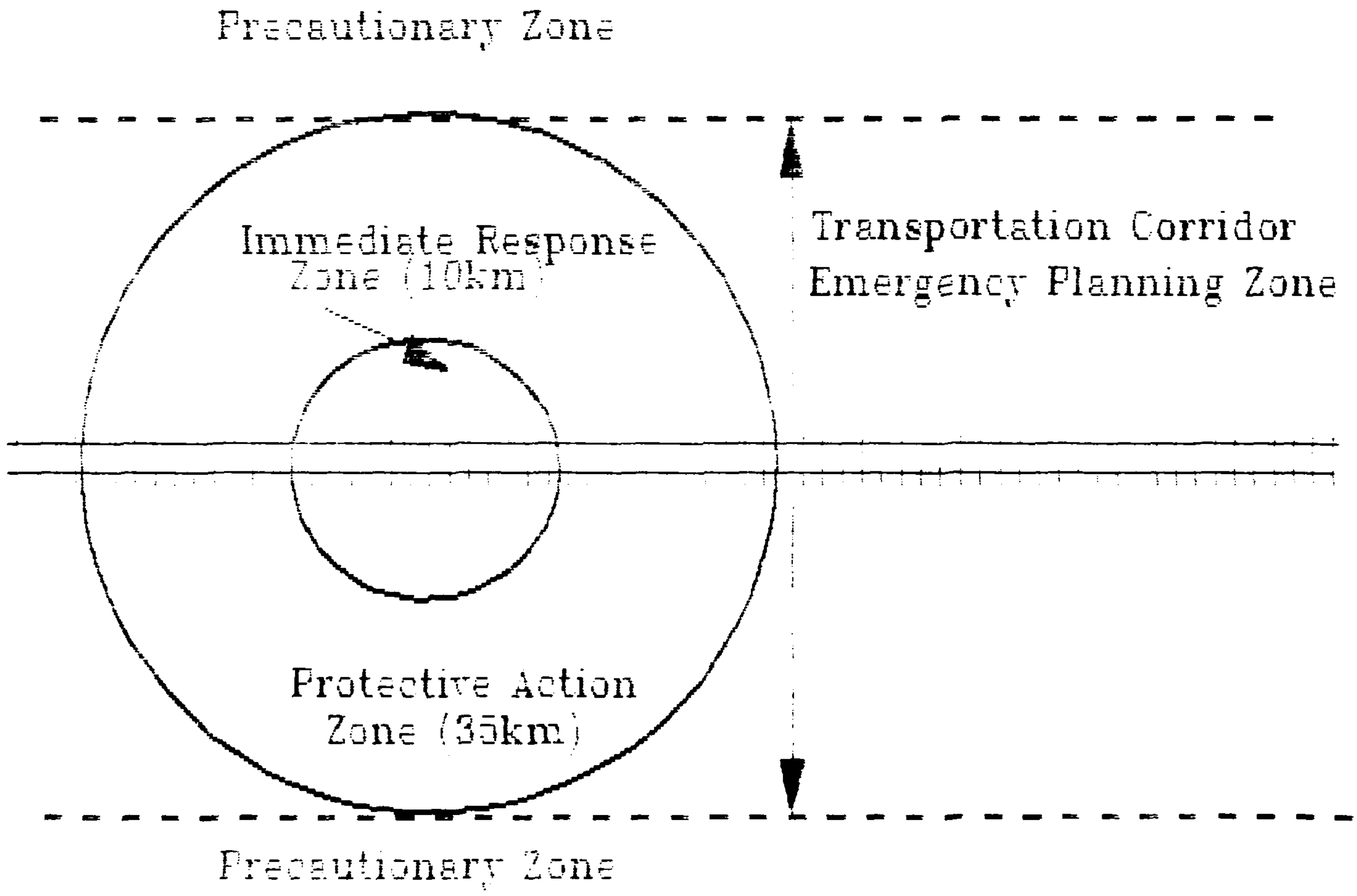
The emergency planning zone concept for rail transportation is described as a moving circular boundary emanating from the munitions train as it moves along the rail transportation route. For the mobile emergency response

organization this emergency planning zone is significant as a fixed zone at the point where an accidental agent release takes place. For secondary response organizations this emergency planning zone is significant as a corridor formed by predetermined boundaries on either side of the rail lines designated. The size of the moving circular emergency planning zone is established as a 10 km distance in all directions from the munitions train for primary response by the mobile emergency response organization. This distance corresponds to the IRZ described for fixed sites and is considered to be the maximum distance for which a mobile emergency response organization, originating from near the release point, can effectively implement primary response functions. The width of the emergency planning zone corridor for secondary response purposes can be considered as a 35 km distance from the rail line, which corresponds to the PAZ described for fixed sites. This area will allow for general planning for the entire corridor potentially impacted by an accident and will also include a 35 km circular boundary emanating from the munitions train at the point where an accidental release occurs. Additional precautionary measures will be developed for implementation outside of the PAZ, as with the Precautionary Zone described for fixed sites. A graphic description of the emergency planning zone concepts for rail transportation is shown in Figure 1-2.

### 1.4.5 Emergency Planning Zone - Water Transportation

Emergency planning zone concepts for water transportation of chemical agent are similar to those for rail transportation. The emergency planning zone is described as a circular boundary which moves along the designated Chesapeake Bay portion of the transportation route. This planning zone can be conceptualized as a fixed zone at any one point along the route and as a corridor that accommodates emergency response program development and coordination for all land areas potentially affected. The size of the circular and corridor EPZ is shown as a 10 km distance from the Chesapeake Bay transportation route. This corresponds to the IRZ for fixed sites and is also appropriate for the PAZ since only mustard agent is involved. A precautionary zone outside of the principal circular and corridor emergency planning zone should be established to accommodate broad-area information

# Figure 1-2
# EMERGENCY PLANNING ZONE CONCEPTS FOR RAIL TRANSPORTATION OF CHEMICAL AGENTS



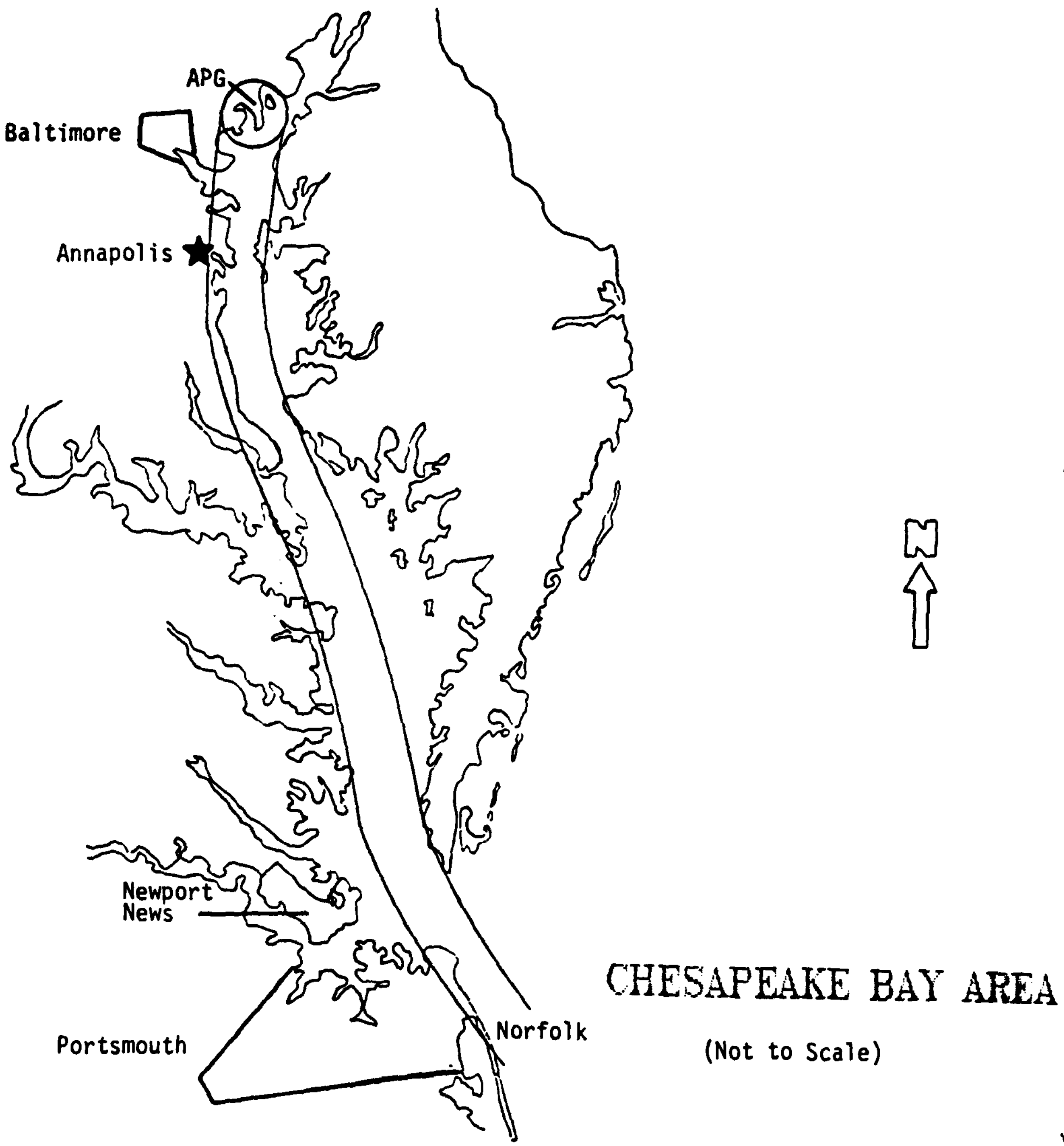
dissemination programs outside of the immediate response area. The emergency planning zone concepts for water transportation of chemical agent are described on Figure 1-3.

### 1.4.6 Emergency Planning Zone - Air Transportation

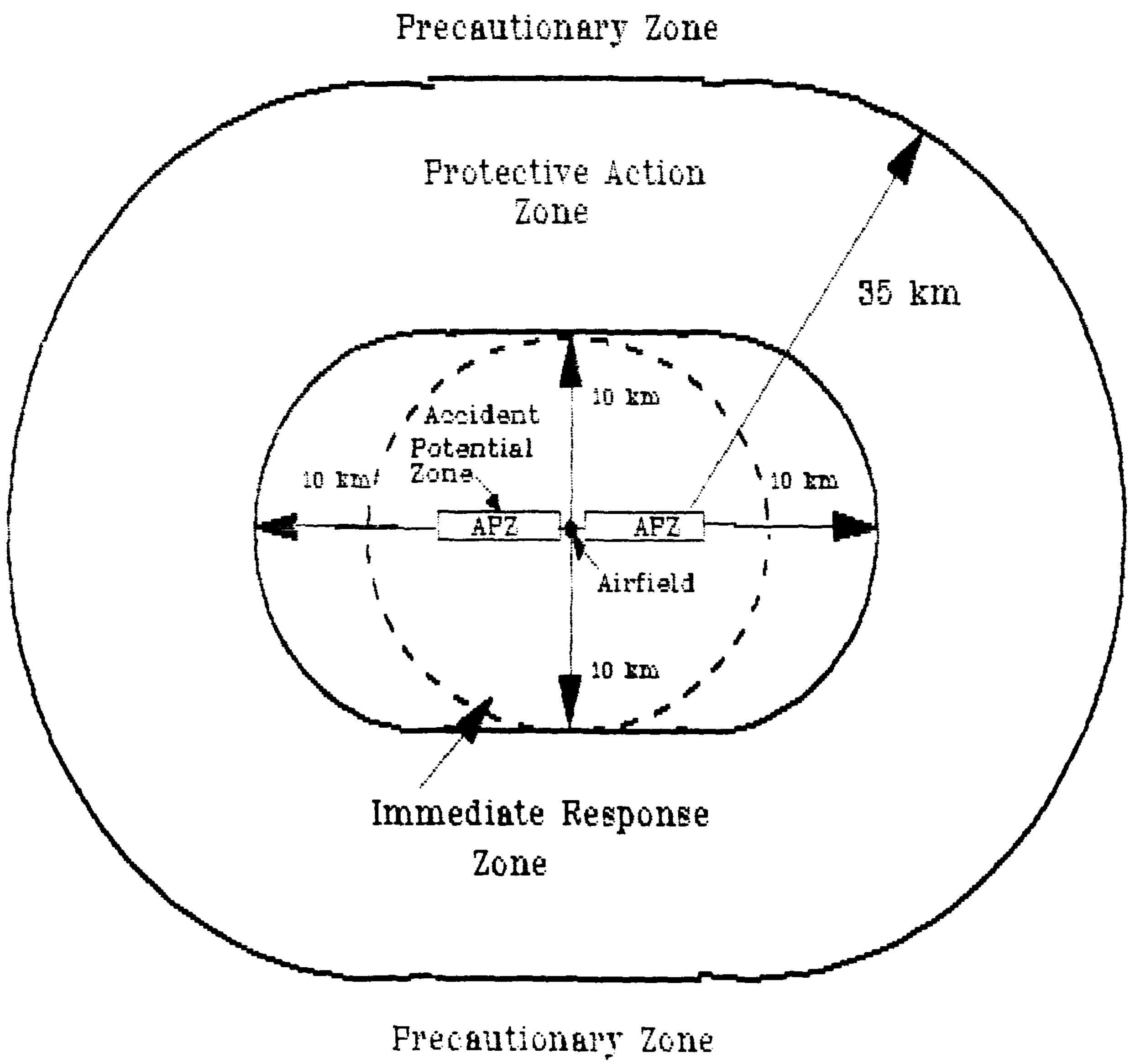
The emergency response concepts for air transportation of chemical agent from Lexington-Blue Grass Army Depot and Aberdeen Proving Ground to Tooele Army Depot involve an expansion of the fixed site EPZ's for those sites to accommodate the increased risk during take-off and landing operations. The transportation plan describes accident potential zones and clear zones for approach and departure that extend to 15,000 feet on either end of all active runways. In order to develop emergency response programs for accidents occurring in these zones, the EPZ's for each of the sites involved are extended in either direction on the assumption that the point source for an accident can occur at any point in these zones. The resultant EPZ is elongated and extends for 10 km (IRZ) and 35 km (PAZ) from the storage and handling areas, as well as any point within the extended clear and accident potential zones on both ends of the runways. These same EPZ configurations are appropriate for any airfields designated as emergency landing sites for the air transportation alternative. In the case of Aberdeen Proving Ground the PAZ and IRZ may be considered as the same 10 km elongated EPZ since only mustard agent is present at the site.

An air corridor will be designated for air transport operations and general programs will be developed for broad-area information dissemination and support operations within these corridors. This area will be treated much like the Precautionary Zone for fixed sites, however, since potential variations in flight paths due to weather conditions and mechanical malfunctions make it extremely difficult to predict all but general areas of potential impact. The emergency planning zone concepts for air transportation of chemical agents are graphically portrayed in Figure 1-4.

## Figure 1-3
## EMERGENCY PLANNING ZONE CONCEPTS FOR WATER TRANSPORTATION OF CHEMICAL AGENTS



# Figure 1-4
# EMERGENCY PLANNING ZONE CONCEPTS FOR AIR TRANSPORTATION OF CHEMICAL AGENTS



# 2. EMERGENCY RESPONSE CONCEPTS

## 2.1 INTRODUCTION

This section of the ERCP presents a general description of the emergency response programs that will be established in support of the Chemical Stockpile Disposal Program. The purpose of this section is to describe the concepts to be applied in establishing emergency response programs for each of the stockpile disposal alternatives. Principal component areas of the response programs are briefly discussed and a summary of the concepts presented.

Section 2.2 presents overall emergency response concepts for fixed sites. Section 2.3 presents additional concepts related to the transportation disposal options.

## 2.2 EMERGENCY RESPONSE CONCEPTS FOR FIXED SITES

The emergency response concepts that apply to fixed sites have been analyzed on a programmatic basis. They are summarized here as a general description of the programs that will be put in place at each site to mitigate the affects of an accidental release of chemical agent. The application of these concepts may vary from site to site in consideration of unique site characteristics and the makeup of the agent stockpile at each site. Emergency response concepts for fixed sites are described in four principal areas: Emergency Response Management, Protective Actions and Responses, Emergency Resource and Information Management, and Program Development and Implementation.

### 2.2.1 Emergency Response Management

An emergency response program will be established at each stockpile storage site that clearly delineates authorities and responsibilities for various aspects of emergency response. The Army command for each storage site has authority and responsibility for initial response to accidents that occur on-site and for protection of on-site personnel and mitigation of accident consequences. It is also responsible for performing various actions to alert and inform community officials of the nature of an accident and appropriate measures for protection of the civilian population. Community officials have the authority and responsibility to implement actions for public protection and to coordinate emergency resources and information during all phases of the emergency response that involve a threat to the civilian population.

The on-site organization for command and control of emergency response is described in the Chemical Accident/Incident Response and Assistance (CAIRA) plans for each of the stockpile storage sites. Although the emergency organizations are currently designated in these plans, some additional provisions will include 24 hour coverage, enhanced capabilities to conduct

accident assessments and a command structure for making response decisions rapidly in the event of an accidental release of chemical agents. Off-site response organizations vary from site to site. Generally, off-site command and control for a chemical agent accident is at the county level of government. In some instances, local jurisdictions such as cities and town have significant emergency resources and will be involved in command and control of accident response. However, for most sites and accident scenarios, emergency response management is most effectively implemented at the county level of government. County government is typically able to respond most effectively to major emergencies, particularly rapidly occurring emergencies, until state and federal resources can become involved in the response.

The emergency response management structure for each storage site will establish the mechanisms and support arrangements for state and federal involvement in emergency response. State involvement will vary from site to site based upon the established structures, authorities and capabilities for state response. State and federal response will in most instances involve a few to several hours of mobilization time and will be effective in various support activities such as medical assistance, evacuee care and environmental monitoring. The initial response for public protection must be accomplished jointly by the local Army command organization at each stockpile site and the local government agencies in the vicinity of the site. Support and assistance arrangements will be established to ensure the effective utilization of state and federal resources as they are mobilized.

The management of emergency response must be supported by appropriate facilities, communications capabilities and pre-established mechanisms for accident assessment and decision-making in order to be effective. Emergency Operations Centers (EOC's) both on-site and off-site will be established, or upgraded, to provide adequate space, operational displays, communications and other equipment to support effective emergency response. Emergency facilities currently exist on-site at each storage location and will be upgraded as necessary to support effective emergency response management.

Many of the county governments around the eight stockpile locations have an EOC, although substantial upgrade is necessary in many cases to ensure operational capability. Primary and back-up communications systems will be installed in the on-site and off-site EOC's to allow for reliable notification by the storage site command to all affected local governments of an accidental chemical agent release and to provide follow-up information during the emergency response. In addition, each local government EOC will have the ability to communicate by radio with all operational response forces in the field in order to coordinate and manage the off-site response.

The on-site EOC will be equipped with computerized dispersion modeling systems, supported by local meteorological stations, that can predict the off-site areas affected and project the impact of a chemical agent release on the civilian population. An accident classification system will be established, specific to the particular stockpile, that will allow for rapid characterization of an accident occurrence and early notification to off-site authorities. Automated real-time agent monitors will be installed at each storage site to aid in the early detection of an accidental agent release. Procedures and mechanisms will be established jointly between the on-site and off-site emergency organizations to support timely decision-making on appropriate actions for public protection including provisions for precautionary actions, automatic actions (for certain types of rapidly occurring events that require immediate public protection), and discretionary actions that involve specifying differing protective actions for different locations based upon agent concentrations, meteorological conditions and response times available.

Capabilities for rapidly detecting and characterizing an accident occurrence, making decisions on the most appropriate action(s) for public protection and implementing those protective actions are essential functions of emergency response management. The authorities and responsibility for performing these functions are shared jointly by the local storage site command and local government authority. While the storage site command is most knowledgeable of potential accident circumstances and impacts, local government authorities are responsible for

protection of the civilian population. Close cooperative relationships must be established between the stockpile storage site commands and the surrounding local government authorities so that appropriate actions for public protection can be implemented quickly and effectively. The emergency program managers, both on-site and off-site, must hav in-depth training and regular interaction to maintain an ability to manage the emergency response to a chemical agent accident.

### 2.2.2 Protective Actions and Responses

The emergency response program at each stockpile storage site will establish the systems, resources and response capabilities needed to implement appropriate actions for protection of the civilian population. Capabilities will be established for three principal methods of public protection: evacuation, sheltering and individual protection. Evacuation will be implemented when sufficient time is available to move people without exposing them to significant amounts (concentrations) of chemical agent. Sheltering will be implemented when there is not sufficient time for evacuation. Since sheltering alone does not provide adequate protection from lethal concentrations of chemical agent, additional measures will be taken to provide a high degree of protection for populations in close proximity to the stockpile storage sites where evacuation may not be possible because of limited warning and response times. Measures will be taken to improve the sheltering protection of certain buildings that house sensitive populations such as schools, hospitals and nursing homes near the storage sites. Protective equipment will be provided as another means of protection to populations in close proximity to the stockpile storage sites. Protective equipment includes civilian facemasks and mouthpiece respirators, hooded jackets for young children and protective infant carriers. Individual protective measures have the added benefit of being useful in combination with other protective actions such as evacuation or sheltering.

A number of support systems and capabilities will be put in place to ensure that the means for implementing various protective actions are available. Most significant is the installation of a public alert and notification system that is capable of alerting civilian populations to an accident and notifying them of the actions they should take to protect themselves. This system will be established using a number of alerting devices in combination to provide the most effective capability for each site. Outdoor warning sirens and indoor warning devices including tone alert radios and automated telephone alerting systems will be installed and supported by Emergency Broadcast System (EBS), cable television override and other public information mechanisms to provide good overall coverage. In areas closest to the storage sites full coverage will be established for both indoor and outdoor alert and notification. At greater distances one or more of the alerting systems or mechanisms will be utilized to provide sufficient warning time for the public to take appropriate protective action(s).

Evacuation of the civilian population requires comprehensive planning and a number of support mechanisms. A detailed Evacuation Time Estimate (ETE) study will be conducted for the area surrounding each storage site establishing evacuation routes, pinpointing traffic control locations and providing estimates of evacuation times under various scenarios and weather conditions. The ETE will provide an important basis for protective action decision-making at the time of an accidental release of chemical agent. Detailed traffic and access control plans will be developed to facilitate the implementation of evacuation. Emergency plans will be developed for all special facilities such as schools, hospitals and nursing homes and the transportation resources require to evacuate such facilities identified and agreements obtained for their use in an emergency. A survey will be conducted to identify individuals within the general population with special needs such as the handicapped, hearing and sight impaired, medically disabled and those without a means of transportation so that special assistance can be provided.

Protective equipment will be provided to all civilian emergency workers that have a role in emergency response to ensure that they are protected from exposure to chemical agent while performing their duties. This will include full protective clothing and respiratory protection as well as auto injectors for use of agent antidotes should this be necessary. The full range of potential protective actions and responses will be planned for and programs implemented at each site to ensure that protective measures can be implemented quickly and effectively.

### 2.2.3 Emergency Resource and Information Management

A significant number of resources will be needed to implement certain protective actions and to provide care to populations affected by an accidental release of agent. The identification and management of these resources for emergencies and the provision of accurate and timely information to the civilian population are important components of the emergency response program for each storage site.

The principal resources needed to implement protective actions are transportation resources to aid in evacuation of affected populations. This includes buses to move school children and other institutionalized populations that are dependent on others for transportation. Ambulances will be needed to move certain sensitive populations including some hospital patients, nursing home residents and the medically disabled. Although many such transportation resources are available in the local areas affected, supplemental resources will likely be required from outside of the area in the event of a major agent release. Adequate transportation resources from surrounding areas will be identified, agreements made and procedures developed to mobilize and deploy these resources in an emergency.

Certain resources are required to provide care for affected civilian populations during and after an accidental release of chemical agent. Chief among these are the medical resources needed to provide initial and follow-up medical care to exposed individuals. The existing local Emergency Medical System (EMS) providers will be utilized, but substantial

additional resources may be required. Plans will be developed through the statewide and regional EMS organizations that are already in place in most locations to access the maximum number of medical resources potentially available. Non-traditional resources will be identified such as local health department personnel and social service agencies to aid in the care of affected individuals. In addition, U.S. Army personnel who are trained in medical treatment of agent casualties will be identified to support civilian resources. All civilian emergency medical personnel and hospital staffs in the areas involved will be provided training in the treatment of agent casualties. All medical facilities in the vicinity of the stockpile locations will be provided with agent antidotes and other equipment and supplies that would be needed to treat large numbers of chemical agent casualties. Other facilities such as schools, nursing homes and clinics will be identified to be used as treatment facilities in the event that local hospitals do not have sufficient space to treat all agent casualties.

A myriad of other resources is required to support all aspects of emergency response in the affected communities. Traffic barricades, stretchers, bull horns and other protective and response equipment may be required. A detailed resource inventory will be developed, or updated, for each affected jurisdiction and resource needs specific to chemical agent accidents identified and resolved. Coordination with state-level emergency management agencies will be accomplished during this process to ensure that all available support mechanisms are utilized to provide the resources needed for emergency response to chemical agent accidents.

Public information programs will be implemented to inform the potentially affected populations of the programs established for their protection and to educate them to the appropriate measures to take for their own self-protection in the event of a chemical agent accident. Printed brochures, public service announcements and media releases will be utilized to educate the public to the emergency response program. Public information activities will be conducted regularly during the chemical stockpile disposal program. Additional programs will be established to provide public information at the time of an emergency. Prescripted

emergency announcements for various accident scenarios and protective actions will be provided to the electronic media for use at the time of an emergency. A media center will be established in the vicinity of the stockpile storage site for providing emergency public information during and after a chemical agent accident. An annual media briefing will be conducted at this facility during the stockpile disposal program with representation by the site command, the local officials and the area media organizations, to review emergency public information procedures.

### 2.2.4 Program Development and Implementation

The development of site-specific emergency response programs will be accomplished as a cooperative effort involving Army resources, local government officials and appropriate state and federal agencies and organizations. A set of detailed guidance criteria will be established to ensure that a consistent level of preparedness is provided at all of the stockpile storage locations for each of the component areas of emergency response. Sufficient resource support will be provided to state and local emergency planning agencies to insure that each jurisdiction in the vicinity of a storage site will be able to participate actively in program development and maintain an adequate level of preparedness during the chemical stockpile disposal program.

Program development will initiate with public officials conferences to describe, explain and discuss the intended emergency response program. Comprehensive emergency plans will be developed for each local jurisdiction in the vicinity of the stockpile storage site and for special facilities such as schools, hospitals and nursing homes. Detailed operating procedures will be developed jointly between the storage site command and local officials for critical activities such as accident assessment, accident classification, accident notifications, emergency communications, protective action decision-making, public alert and notification and all other functional areas of emergency response. Evacuation routing, emergency public information programs and other support activities will be implemented specific to each stockpile storage site.

Emergency warning systems, communications, facility upgrades, monitoring and assessment capabilities, and other hardware and equipment required to implement the site-specific program will be identified, obtained and/or installed during the program development process. Protective and other response equipment and supplies will be obtained as needed to support public and emergency worker protection and response. All other activities associated with identification of resources required for emergency response and coordination of Army, community and other state and federal involvement will be accomplished for each site-specific program.

Program implementation activities will include training for all emergency program managers and emergency response personnel in chemical agent accident response. An emergency drill and exercise program will be implemented that involves regular interaction between the storage site emergency organization and the local emergency response organizations. A full scale exercise will be conducted annually during the chemical stockpile disposal program. Table-top exercises for program managers, drills and system tests will be conducted frequently to ensure that each component of the emergency response system is functioning properly and can be fully operational in the event of an accident.

Federal funding sources will be pursued to support the purchase and installation of required warning and communications systems, accident assessment capabilities, emergency protective and response equipment, facilities upgrade and outfitting, and to fund support activities such as evacuation time estimate studies, public information programs, training, exercises and program maintenance.

The development and implementation of a fixed site emergency response program will provide variable benefits, depending upon the nature of the release (quantity of agent, type of agent, mode of release), the prevailing meteorology, and the nature of the affected area. For scenarios which involve large, instantaneous releases of agent coupled with moderate or high wind speeds, the presence of an emergency response program will have minimal benefit for those areas closest to the release point. Large

instantaneous releases with low wind speeds will allow more time in which to implement emergency actions and will permit a significant reduction in exposure for areas further from the release point. The critical factor in determining the benefit of a preparedness program is time. Those scenarios that result in rapid off-site releases of significant agent concentrations will be difficult to mitigate by any emergency response, particularly for areas closest to the release point. Release scenarios that provide for some warning and response time prior to significant off-site releases can be mitigated to a great extent by emergency preparedness programs. In general, those areas located in closest proximity to a fixed site are less likely to benefit from an emergency response program, while areas located at greater distances are likely to realize significant benefits from a response program in most release scenarios.

The qualitative benefits that can be provided by the development and implementation of fixed site emergency response programs, for various accident scenarios and meteorological conditions, are presented in Tables 2-1 and 2-2.

TABLE 2-1
QUALITATIVE BENEFITS OF FIXED SITE EMERGENCY RESPONSE PROGRAMS
FOR NERVE AGENT ACCIDENTS

| ACCIDENT SCENARIO | METEOROLOGICAL CONDITIONS<br>slow wind speeds (1 m/sec.) | moderate wind speeds (3 m/sec.) | fast wind speeds (6 m/sec.) |
|---|---|---|---|
| moderate instantaneous release (100 kg VX) | fatalities possible to 33 km; potential for multiple fatal-ities is high within IRZ; lower in PAZ - high reduction in fatalities at all distances | fatalities possible to 10 km; potential for multiple fatal-ities is high within 2 km; lower to 10 km - low reduction in fatalities to 2 km; higher at greater distances | fatalities possible to 15 km; potential for multiple fatal-ities is high within 4 km; lower to 15 km - low reduction in fatalities to 5 km; higher at greater distances |
| small instantaneous release (10 kg VX) | fatalities possible to 7 km; potential for multiple fatal-ities is high within 2 km; lower to 7 km - high reduction in fatalities at all distances | fatalities possible to 4 km; potential for multiple fatal-ities is mod. within 1 km; low to 4 km - low reduction in fatalities to 2 km | fatalities possible to 6 km; potential for multiple fatal-ities is moderate with 2 km; lower to 6 km - low reduction in fatalities at 5 km |
| large semicontinuous release (1000 kg VX) | fatalities possible to 100 km; potential for multiple fatal-ities is very high within IRZ; lower in PAZ and PZ - high reduction in fatalities at all distances | fatalities possible to 25 km; potential for multiple fatal-ities is high within IRZ; lower in PAZ - low reduction in fatalities to 2 km; high at greater distances | fatalities possible to 15 km; potential for multiple fatal-ities is high within IRZ; lower in PAZ - low reduction in fatalities to 5 km; high at greater distances |
| moderate semicontinuous release (100 kg VX) | fatalities possible to 45 km; potential for multiple fatal-ities is very high within IRZ; lower in PAZ and very low in PZ - high reduction in fatal-ities at all distances | fatalities possible to 8 km; potential for multiple fatal-ities is moderate within 2 km; lower to 8 km - mod. reduction in fatalities at 2 km; greater to 8 | fatalities possible to 7 km; potential for multiple fatal-ities is high within 2 km; lower to 7 km - low reduction in fatalities at 2 km; mod. reduction to 5 km |
| large spill (900 kg GB) | fatalities possible to 12 km; potential for multiple fatal-ities is moderate within 3 km; lower to 12 km - high reduction in fatalities at all distances | fatalities possible to 8 km; potential for multiple fatal-ities is moderate with 2 km; lower to 10 km - high in reduction in fatalities at all distances | fatalities possible to 8 km; potential for multiple fatal-ities is mod. within 2 km; lower to 8 km - mod. reduction in fatalities to 2 km; greater to 8 kms |

TABLE 2-2
QUALITATIVE BENEFITS OF FIXED SITE EMERGENCY RESPONSE PROGRAMS
FOR MUSTARD AGENT ACCIDENTS

| | METEOROLOGICAL CONDITIONS | | |
|---|---|---|---|
| ACCIDENT SCENARIO | slow wind speeds (1 m/sec.) | moderate wind speeds (3 m/sec.) | fast wind speeds (6 m/sec.) |
| moderate instantaneous release (900 kg HD) | fatalities possible to 7 km; potential for multiple fatalities is high within 2 km; lower to 7 km - high reduction in fatalities at all distances | fatalities possible to 2 km; potential for multiple fatalities is mod. within 5 km; low to 2 km - low reduction in fatalities to 2 km | fatalities possible to 1 km; potential for multiple fatalities is low - potential for precautionary measures is low |
| small instantaneous release (10 kg HD) | fatalities possible to 1 km; potential for multiple fatalities is low - high potential for taking precautionary measures | fatalities possible to 0.2 km; potential for multiple fatalities is very low; low potential for precautionary measures | fatalities possible to 0.15 km; potential for multiple fatalities is very low - precautionary measures unlikely |
| large semicontinuous release (4000 kg HD) | fatalities possible to 100 km; potential for multiple fatalities is very high within IRZ; lower in PAZ and PZ - high reduction in fatalities at all distances | fatalities possible to 10 km; potential for multiple fatalities is high within 2 km; lower to 10 - low reduction in fatalities to 2 km; high at greater distances | fatalities possible to 7 km; potential for multiple fatalities is high within 2 km; lower to 10 - low reduction in fatalities to 5 km; high at greater distances |
| moderate semicontinuous release (100 kg HD) | fatalities possible to 8 km; potential for multiple fatalities is very high within 2 km; lower to 8 km - high reduction in fatalities at all distances | fatalities possible to 2 km; potential for multiple fatalities is moderate within 5 km; lower to 2 km - mod. reduction in fatalities at 2 km | fatalities possible to 1.5 km; potential for multiple fatalities is high within 5 km; lower to 1.5 km - low reduction in fatalities at 1.5 km |
| large spill (900 kg HD) | potential for fatalities is very low-high likelihood of successful precautionary measures | potential for fatalities is very low-high likelihood of successful precuationary measures | potential for fatalities is very low-high likelihood of successful precuationary measures |

## 2.3 EMERGENCY RESPONSE CONCEPTS FOR TRANSPORTATION ALTERNATIVES

The emergency response concepts that apply to the chemical stockpile disposal program alternatives involving transportation of munitions have been analyzed for each of the modes of transportation being considered. They are summarized here as a general description of the programs that would be put in place for each alternative. Emergency response concepts are described for three modes of transportation: Rail Transportation, Water Transportation and Air Transportation.

### 2.3.1 Rail Transportation

An emergency response program will be developed for the rail transportation of chemical munitions that is based on a mobile emergency response escort capability that travels with each rail shipment. This capability would be supplemented with state-level emergency response planning by states within the affected rail corridor. The mobile escort capability will consist of Army personnel and resources for implementing the primary public protective measures that are conducted by community officials in the fixed-site emergency response programs. These activities include public alert and notification, traffic and access control, assistance to affected populations and initial medical intervention and care. The escort emergency response organization will coordinate its activities with local officials and emergency response personnel at the site of an accident. They must be prepared to conduct all immediate response measures necessary, however, since no substantial detailed local planning or training for chemical agent accidents will be conducted for the rail transportation alternatives. The effectiveness of such a mobile capability is very unlikely to approach the level of effectiveness afforded by a fixed site emergency response program.

The escort organization will include sufficient personnel to manage the emergency response, coordinate responses with civilian emergency response personnel and conduct public warning and other immediate public protective actions in the vicinity of the accident. It will be equipped with computerized dispersion modeling and accident assessment capabilities, radio

communications, public alerting devices, appropriate transportation capabilities (e.g., all terrain vehicles) and sufficient protective equipment and medical supplies for escort and local civilian emergency response personnel.

The state-level emergency response planning will focus on providing expedient resource support to the site of a rail transportation accident from state or nearby local government resources. However, such support will likely require up to a few hours to mobilize and deploy to an accident location. State coordinated support will be effective for secondary activities (i.e., medical and evacuee care, security, etc.) but will not likely be effective for the principal response activities needed immediately following an accident.

The limitations associated with deploying all or most of the emergency response resources from a mobile escort capability limit the potential effectiveness of such a response. Under certain accident scenarios and conditions this capability can be effective in reducing civilian casualties. However, for accident conditions that do not involve easy access to affected populations, the mobile emergency response capability cannot be effective in preventing civilian casualties.

### 2.3.2 Water Transportation

An emergency response program will be developed for the water transportation alternative based on a mobile response capability that moves along with the munitions shipment as it travels through the Chesapeake Bay portion of the route. The mobile response capability would involve Army response personnel and equipment moving through the potentially affected areas on both shores of the Chesapeake Bay. This one-time movement would be closely coordinated with the state and local emergency response organizations in the areas affected.

The mobile response capability will include all resources required to implement immediate public alert, notification and protective measures in

the event of an accident, coupled with existing capabilities in the communities affected. An extensive public information program will be implemented in the Chesapeake Bay area to advise residents of the hazards and provide information on protective measures. The emergency response program for the one-time shipment would involve detailed logistical planning to ensure full coverage of affected areas by the mobile response organization. Extensive coordination with state and local emergency response organizations will be accomplished and detailed procedures for operational response developed. communications equipment, mobile command posts, mobile alerting equipment, protective clothing and medical supplies will be identified and prepositioned along the route to support an emergency response.

Since the land areas affected by the water transportation alternative are relatively limited, as compared to the rail corridor, substantial resources and response capabilities can be employed to mitigate accident consequences. However, several densely populated areas, including the City of Baltimore, are affected by the water transportation alternative. The combined mobile and fixed emergency response resources cannot eliminate the potential for many civilian casualties should an accident occur near a densely populated area. It is appropriate to consider precautionary evacuation of the affected areas for the one-time movement to further mitigate the potential for civilian casualties in the event of an accident.

### 2.3.3 Air Transportation

The emergency response programs for the disposal alternatives involving air transportation are based principally on an expansion of the fixed site programs for the sites involved. The emergency planning zones for these sites are expanded due to the accident potential zones which extend to 15,000 feet at each end of the runway. In addition, fixed site emergency response programs will be established for any emergency landing sites designated for the air transportation alternative.

Emergency response forces will be positioned at various locations along the general air corridor to respond to accidents that occur in transit. However, these forces will likely be unable to locate and reach a crash site soon enough to implement the primary protective measures necessary immediately after an accident occurrence. The emergency response programs for the air transportation alternatives are principally fixed site response programs and can be reasonably effective in mitigating accidents that occur on the storage site. If an air crash occurrs within populated areas in the emergency planning zones for the fixed sites, it would not be possible to prevent significant civilian casualties in those areas.

## 2.4 SUMMARY

The emergency response concepts that have been presented for the on-site and transportation alternatives are based on established and accepted principles of emergency management. Sound models for these programs exist in the Radiological Emergency Preparedness Programs currently implemented for fixed nuclear facilities by the Federal Emergency Management Agency and the Nuclear Regulatory Commission and in the Chemical Emergency Preparedness Program and Hazardous Materials Emergency Planning Guidance of the U.S. Environmental Protection Agency and National Response Team, respectively.

The concepts developed for each stockpile disposal alternative vary in that each poses a unique set of problems and circumstances that must be considered in fashioning appropriate response programs. It is clear that planning for accidents that occur at fixed, defined sites can be accomplished in greater detail and with much greater assurance of an effective response capability than planning for accidents that occur during transportation. But even the fixed-site programs do not provide complete assurance that loss of life can be prevented.

The concepts presented here are intended as a general description of how such programs will be implemented, as needed, to support the Chemical Stockpile Disposal Program. An important process of cooperative interaction, involving a myriad of local, state and federal agencies and organizations, must be accomplished for these emergency response concepts to be effectively implemented. For fixed-site emergency response planning, the relationship between the U.S. Army command at each stockpile site and the surrounding community organizations is central to development of programs for the protection of the surrounding populations. For transportation emergency response planning a broad range of local, state and federal agencies must be actively involved in planning for accidents that could occur across a potentially expansive area affecting literally thousands of jurisdictions, agencies and populations.

The significance, complexity and magnitude of these efforts should not be underestimated. Planning for fixed site emergencies should proceed as soon as is practical since these programs are needed regardless of the disposal alternative selected. Detailed standards and criteria will be established to ensure that emergency response programs are implemented consistently across all of the stockpile storage sites. Should a disposal alternative involving transportation of chemical agent be selected, comprehensive and detailed criteria for emergency response will be developed for the alternative-specific program required.

# 3. CONCEPTUAL ANALYSIS

## 3.1 INTRODUCTION

The Conceptual Analysis section of this ERCP provides an in-depth analysis of the emergency response concepts identified in Section 2. The purpose of this section is to present a complete introduction, discussion and analysis of each component of the emergency response system in order to allow the reader to fully understand the factors which have been considered in the development of the final ERCP. Each component is introduced and discussed as a general emergency management issue. Additional or special considerations for the chemical stockpile disposal program are introduced and their implications assessed. Alternative implementation strategies are discussed where applicable and conclusions are drawn for appropriate application of the component to the program.

Section 3.2 provides a conceptual analysis of emergency response issues related to fixed sites. Section 3.3 provides a conceptual analysis of additional implications for those stockpile disposal alternatives that involve the transportation of chemical agents.

## 3.2 EMERGENCY RESPONSE CONCEPTS FOR FIXED SITES

The purpose of this section of the ERCP is to provide a detailed analysis of emergency response concepts for fixed sites and their application to the chemical stockpile disposal program. Fixed sites include the eight current chemical stockpile storage sites, which must be addressed regardless of the disposal option (on-site disposal, national or regional disposal, limited collocation, or continued storage) selected. Four primary areas of emergency response are identified. Thee consist of: Emergency Response Management; Protective Actions and Responses; Emergency Resource an Information Management; and Emergency Response Program Development and Implementation.

### 3.2.1 Emergency Response Management

The concept of emergency response management encompasses a wide variety of technical components. A system must be established in which lines of authority and responsibilities are well established. The roles of local, state and federal governments must be defined, as well as the role played by the Army at each installation and through its command structure. There must be a capability for the rapid transfer of information between involved organizations. A capability to determine the nature and potential consequences of an accident, and to base response decisions on that information, must be established at each fixed site.

Consequently, the category of emergency response management has been further divided into five discrete components: Coordination of Emergency Response; Command and Control; Communications; Accident Assessment; and Protective Action Decision-Making. A detailed discussion of each component follows.

#### 3.2.1.1 Coordination of Emergency Response

##### 3.2.1.1.1 Introduction

The emergency response to an accident involving chemical agents will occur in stages and the management of the response should reflect these different stages. Initial response to such an accident will likely be the responsibility of local government with the input and assistance of the affected Army installation; the Army's primary management role will be limited to the on-site response. Depending upon the nature and magnitude of the accident, the secondary response will likely be primarily state-managed or managed by a mixture of state and federal authorities; the long term response will likely be managed by the state and/or federal governments. Army responsibilities are discussed further in Sections 3.2.1.2, Command and Control, and 3.2.1.4, Accident Assessment.

##### 3.2.1.1.2 Discussion

The initial response involves those activities that are designed to protect the residential population from the immediate effects of exposure to a chemical agent release. The most practical means of managing the initial response is to establish a local government emergency management program so that decisions are implemented within a very short time frame. There may be minimal time available for emergency response activities, which may not allow direct consultation with emergency management officials at the state and federal levels. The local government will have to determine the appropriate protective response options for the general public, notify the public of recommended actions for personal protection, control access to the affected area, provide protective equipment for emergency workers, ensure the provision of emergency medical care, provide care for populations with special needs, and perform a myriad of other activities in a direct and immediate response to the emergency. It is not realistic to rely on any level of government other than local government to manage and accomplish the necessary activities for the immediate response. Some accident scenarios may allow time for consultation with state and/or federal agency officials

and even for such assistance to be initiated; however, planning cannot depend on such outside augmentation. Local governments must be capable of managing the initial response and all that it entails without outside assistance.

It would be advisable, in order to respond to situations which have a rapid onset and which require immediate action, to pre-authorize the local Army command structure to directly implement initial off-site responses, particularly in the area of public alert and notification. The authority for such an action by Army personnel must be evaluated on a site specific basis.

An integral part of the initial accident response process will be the notification of the state emergency management agency, the state environmental protection agency, and appropriate federal agencies. Facility plans will also call for the automatic notification of the U.S. Army command structure, as appropriate. Several federal agencies have emergency response capabilities and can be on the emergency scene with available expertise and equipment within hours of the initial notification. Emergency plans will describe the orderly coordination of emergency response activities between the local, state and federal agencies. This coordination is site specific and dependent upon the capabilities and legal basis for such management in each involved jurisdiction.

Assuming that the population at risk has been removed or protected from the hazard during the initial response, the primary management considerations for the secondary response will include emergency medical care, long term health considerations, environmental impact assessment and emergency mitigation efforts. State and possibly federal agriculture and wildlife agencies may become involved in the secondary response if there is chemical contamination and/or exposure of wildlife or livestock. Legal representatives at all levels of government may become involved in the secondary response. Research of local ordinances, state and federal laws must be conducted as part of the planning process at each site, to establish the legal basis for the management structure for the secondary response.

The long term response to an emergency involving a chemical agent release will primarily be concerned with the enduring impact of the chemical agent on populations, air quality, wildlife, water supplies, agricultural crops, etc. The responsibility for the management of this phase must be coordinated between the Army and other appropriate federal agencies. Research of applicable laws in each state and coordination among the appropriate Army, local, state and federal officials will firmly establish responsibilities as a part of the site-specific planning process.

### 3.2.1.1.3 Alternatives

There are limited alternatives in developing a structure for the management of an emergency response. Because of the necessity for prompt response in implementing protective actions, the initial response must be implemented and managed by local government, possibly in conjunction with local Army officials. The secondary response will often affect multiple jurisdictions, requiring coordination and resource support from the state level. Depending upon the magnitude and impact of the accident, the long-term response may be managed at the state or federal level. The majority of factors which impact upon the structure of emergency response management are site-specific and must be addressed during site-specific planning.

The primary benefit to be derived from local (governmental or Army site) control of the immediate response is the speed with which necessary decisions can be made and response actions initiated. The benefits from state and federal involvement derive primarily from the additional resources which such levels of government can provide, and from enhanced coordination of the actions of multiple local jurisdictions.

### 3.2.1.1.4 Conclusions

A local emergency management capability will exist within each affected jurisdiction which has the capability, at a minimum, to receive emergency notifications, formulate protective action recommendations, activate a public alert and notification system, and implement appropriate protective

responses including evacuation of the public. The extent of a direct Army role in initiating immediate off-site responses, and authority for such actions, will be assessed on a site-specific basis. All site-specific emergency response plans will identify the federal, state, local and private sector organizations which are involved in the emergency response, and describe their involvement and relationship to the total effort. Each level of government involved in the emergency response will define its own chain of command and designate a specific individual with the authority to direct the emergency response. In order to comply with state and local legal requirements and to tailor the response coordination to local conditions, the interrelationships between local, state and federal levels of government in the management of the emergency response will be resolved on a site-specific basis and defined in site-specific plans.

### 3.2.1.2 Command and Control

#### 3.2.1.2.1 Introduction

The command and control of emergency response activities addresses the need to centralize decision-making while involving representatives of all responding organizations. Command and control of a chemical agent accident with offsite consequences involves both on-site and off-site authorities. On-site command and control for a chemical accident response is defined in the individual on-site emergency plans. The command and control structure in off-site communities may vary, but will consist of the chief elected official or his designee coupled with an emergency response staff organization.

#### 3.2.1.2.2 Discussion

On-site command and control at the storage/disposal sites is addressed in existing Chemical Accident/Incident Response and Assistance plans. Off-site command and control should be vested with the chief elected official of each political jurisdiction involved in the response. As a general concept, the initial responsibility for emergency response rests with the lowest level of government affected by an emergency. If more than one local government is affected, or if the resources of the local government are inadequate, the next higher level of government becomes involved as a coordinating agency.

Command and control of the off-site emergency response will be centralized in an Emergency Operations Center (EOC) designated and equipped for the purpose. Where multiple jurisdictions are involved, the issues of separate EOCs and coordinated management must be investigated. The EOC will be staffed by the chief elected official of the jurisdiction (or his designee) and an emergency response staff composed of representatives of involved agencies and organizations. Typically, EOC staffing will include representatives from law enforcement, fire, medical, public information, school,

transportation and social service organizations. The organization of the EOC staff and the entities represented can vary considerably depending upon the characteristics and resources of the community involved. The principal consideration is that all organizations and agencies that may potentially be involved in emergency response be represented in the EOC.

### 3.2.1.2.3 Alternatives

The level of local government establishing and operating an EOC for direction and control purposes may vary from site to site. Local jurisdictions below the county level of government may not have sufficient resources and capability to directly respond to an emergency. In this case, command and control of emergency operations would be accomplished at a county level of government. However, where sufficient resources and capabilities exist, sub-county jurisdictions within the vicinity of the site could perform the principal command and control function for their area of jurisdiction. A combination of county-level and below county-level command and control mechanisms may also be appropriate, given the existing capabilities around each site. It is less likely that state-level or regional direction and control of the initial response can be effective. Although locally positioned state resources may be involved in the initial response, the majority of state-level resources that might be employed in emergency response are likely too far distant to be immediately available.

The command and control mechanism established for the initial response will be that which can most effectively coordinate the utilization of immediately available resources. It should be recognized, also, that the protective action options available for public protection during an accidental release of chemical agent are largely dependent upon actions taken by the general public for self-protection. Even though local resources can facilitate and support these protective actions (e.g., traffic control, transportation assistance) the most important function of the command and control mechanism is to ensure that timely and accurate alert/notification and information are provided to the public, in order to achieve the most effective public

response. Certain other functions (e.g., medical assistance, mass care) can be provided by locally available resources and augmented by outside resources as they become available.

It may be appropriate for the local Army command structure to be delegated the authority to implement immediate off-site responses in a rapidly developing accident. Such an agreement could result in a more rapid initiation of essential actions such as protective action decision-making and public alert and notification.

Some current site plans call for the assignment of an Army Liaison Officer to the off-site EOC at any time it is activated for a chemical emergency response. This liaison, or storage/disposal facility technical representative, will be someone with a detailed technical knowledge of chemical agents and their effects, as well as a knowledge of on-site and off-site emergency response programs. Such a technical representative can be an invaluable asset to local officials in responding to a chemical accident, by providing technical assistance, explaining on-site circumstances and directly linking on-site and off-site actions.

#### 3.2.1.2.4 Conclusions

The establishment of command and control mechanisms which are responsive to local conditions and needs, including issues of multiple jurisdictions and sub-county jurisdictions, must be done as part of a site-specific planning process. Each county which has any significant area within the Protective Action Zone (including the Immediate Response Zone) will have a functional EOC. The EOC(s) established to support the command and control function will be capable of comfortably accommodating the EOC staff, decision-makers, and support staff including dispatchers, message control staff, and support personnel, as appropriate. Each EOC will have the capability to reliably communicate with all necessary organizations. If the EOC is located within the Protective Action Zone (including the Immediate Response Zone), it will be outfitted to provide a high degree of protection to EOC personnel, or a reasonable alternate EOC will be designated outside of the Protective Action

Zone. Each EOC will be capable of operating for an extended time, with provisions for emergency power, food, sanitation and sleeping accommodations for a full staff complement. Each county EOC will have as a member of its staff an Army technical liaison on an around-the-clock basis whenever the EOC is activated in response to a chemical agent accident.

### 3.2.1.3 Communications

#### 3.2.1.3.1 Introduction

In planning and implementing an emergency response program, the key link which permits activation and operation of the various response components is communications. The communications component serves to integrate all of the sub-systems of the total program.

#### 3.2.1.3.2 Discussion

The establishment of direct, reliable and effective communications between the on-site emergency organization and the off-site emergency organization is essential to the coordination of emergency response to a chemical agent release. Additional communications systems are necessary to support inter-jurisdictional communications needs, as are systems required for jurisdictions to communicate with field response units for command and control of field operations.

Information must be transferred to the responsible off-site agencies as quickly as possible. Mechanisms for this transfer must be reliable. Message transfer could be by means of the standard "dial-up" telephone network; however, the standard telephone network could be affected by outside influences. The system could be made inoperational due to weather conditions, damage to the lines, or an excessively high call rate which slows down the public telephone switch. A radio network could also be utilized to avoid the telephone system.

For the on-site to off-site initial notification, the information will best be handled in a form which both gains the attention of the off-site personnel and provides specific information in the most expedient way. This is generally accomplished by an alarm followed by a voice or hard copy message. A two-way requirement for acknowledgement of the message may increase the time factor but will raise the level of confidence. The initial on-site to off-site notification must go to an area which is staffed

around the clock and which has the mechanisms to further disseminate the messages and activate resources. Systems which require the information to be first entered via a keyboard are not as convenient as a spoken message. A prescribed message or simple "alarm" with accompanying procedures is more convenient and expedient.

The emergency notification system will have a high factor of reliability. To achieve this the system will be backed-up with a redundant system so that a primary and secondary avenue are available. Dedicated, non-switched, telephone lines may be the most effective means of communication between the on-site response coordination point and the off-site response coordination center(s). The dedicated lines may be limited in their application due to the distances involved and telephone facility limitations. These may be rather expensive if long distances or multiple drops are required. Two way radio links may be utilized as a primary or backup system.

Following the passage of the initial information to the off-site coordination agencies, the off-site agencies require communications capabilities with their respective response agencies. The responders include law enforcement, fire, emergency medical services, rescue, and other public safety resources. While it may be assumed that present command agencies have some type of communications with their respective responders (i.e., fire department with fire vehicles), it should not be assumed that total interagency communications exist. Therefore, special arrangements may be required to permit interjurisdictional communications as well as communications among law enforcement, emergency medical services, fire/rescue and other public safety services.

3.2.1.3.3 Alternatives

There are a wide variety of telecommunications systems available, each with specific advantages and disadvantages. The systems used for initial notification from the storage/disposal site to off-site jurisdictions can be hard-wired (dedicated telephone, off-premise extensions of a PBX) or radio.

The vast majority of public safety and emergency management communications systems are radio based. However, there is a wide variety of equipment and system configurations in use, and the existing systems vary markedly among the jurisdictions around the existing fixed sites. The degree of development of existing systems also varies; in some areas there are relatively sophisticated emergency communication systems already in place, while other areas have minimal systems. The decision as to the nature and extent of communications system development required among the affected jurisdictions thus will be made on a site-specific basis.

The benefits to be derived from having a reliable notification system between the storage/disposal site and off-site jurisdictions are many, and include the provision of very rapid protective action recommendations and accident assessment data. Coupled with an efficient off-site decision-making system, such a capability will greatly speed the provision of protective action information to the affected public. The benefits of a reliable communications system between the off-site command and control system and its response units include efficient coordination of field units, rapid alerting of response personnel, and rapid relay of essential information to field responders.

3.2.1.3.4 <u>Conclusions</u>

A primary and back-up communications link will be established between the storage/disposal site and all local off-site command and control agencies. The primary link will be either a dedicated telephone line or radio link with the alternate being the inverse of the primary. Provisions will be included for voice and hard copy information exchange. High speed data transfer via computer will be established for hard copy links. Site to off-site radio communications will permit fixed stations as well as portable equipment to be used. A design standard with a reliability factor of 99% will be the goal. Fixed station as well as portable equipment will meet these reliability parameters.

Each off-site command and control agency will have a capability to reliably communicate with its response agencies. Such a capability will be provided primarily by radio systems. Each off-site response agency will have the capability to alert and communicate with its field response units via radio. Off-site jurisdictions will have the capability for interagency (i.e., fire to police) and interjurisdiction (i.e., county to county) radio communication. All additional off-site emergency communication systems will be compatible with communications systems currently in use.

### 3.2.1.4 Accident Assessment

#### 3.2.1.4.1 Introduction

Accident assessment is a two-fold process that involves 1) determination of the type and nature of an accident and 2) determination of the potential impact of an accident. This process involves such activities as accident investigation, monitoring, characterization and classification, as well as dispersion modeling, dose projection and conversion of assessment information to emergency response considerations. Accident assessment is a function of the storage/disposal facility operation and will be conducted principally by Army personnel involved with facility operations.

#### 3.2.1.4.2 Discussion

With the initiation of disposal operations, regardless of the option selected, the handling, movement and processing of munitions and containers holding agent indicate a need for implementation of extensive monitoring activities and procedures for characterizing accidents that can occur during such activities. In general, however, accidents occurring during these phases of operation will likely be observed by facility personnel who would be in a position to immediately characterize and respond to such accidents. In the present storage mode, those accidents with potential for the greatest off-site impact are catastrophic events which are immediately detectable and provide opportunity for immediate characterization (if only general) and response by facility personnel. However, the potential remains for agent releases of various magnitudes during the storage mode, as well as agent release in various scenarios during disposal operations. Therefore, an adequate mix of monitoring systems, using various combinations of response time and sensitivity, is needed at each site. The capability to identify agent releases that might otherwise go undetected for some period of time is an important component of the accident assessment process.

The process of characterizing an accident involves identification (or observation) of a release, or an event that may result in a release, and classifying the accident to allow for the most appropriate on-site and off-site response. Once identified, whether through monitoring activity or observation of an event, facility personnel will expeditiously characterize an accident within a relatively limited set of criteria established for the purpose and rapidly determine whether the accidental release requires an off-site response. The most effective approach to accomplishing this activity is to establish a series of emergency classifications that will trigger the appropriate response. This classification scheme should generally convey the level of seriousness and potential impact of an accident (e.g., impact restricted to the site boundaries, impact off-site possible near the site boundaries, significant off-site impact, etc). Such a classification sequence will allow for immediate response based on the potential level of seriousness, and will be restricted to a relatively few specific accident classifications that will prompt various states of preparedness, or response, by on-site and off-site organizations.

Once an accident has been recognized and classified to accommodate initial response, the potential impact of the accident will be determined. This activity includes developing projections of areas that may be impacted, the potential severity of the impact and the time frame within which the impact may occur. This information will be generated by the use of computerized dispersion modeling techniques that can predict the potential accident parameters. The current dispersion modeling capability utilized by the Army (D2PC) has certain limitations that may diminish its effectiveness for use in dispersion modeling in some accident scenarios. A refinement of the model to allow for ongoing input of changes in the source term and meteorological conditions would be useful in formulating protective action decisions and/or recommendations at the time of an accident. It should be noted, however, that the D2PC model is adequate for pre-emergency projection of accident impacts and downwind hazards.

All such models have limitations; dispersion modeling and dose projection information provide only partial input to a decision-making process that will result in the implementation of a particular action or combination of actions for protection of the civilian population. This decision process will also consider the characteristics of the emergency planning zone(s) (e.g., sub-area designations, topographical and geographical characteristics, pre-established protective action mechanisms for various areas or population groups, and a number of other considerations for the particular area(s) affected). Protective action recommendations based upon dispersion model predictions will encompass no less than a quadrant of a defined emergency planning zone in order to allow for some variability in meteorology and source term.

3.2.1.4.3 Alternatives

There are a variety of monitoring systems and equipment available which can be applied to the accident assessment process. Systems may be calibrated to provide high or low agent concentration information. Some systems provide quantitative information while others alarm to agent levels above a specified concentration. Sampling may be conducted on an automated or manual basis. The Army is currently in the process of determining the details of a monitoring system for the chemical stockpile disposal program.

An accident classification system can be structured from two basic standpoints. One approach is to classify an accident based upon the specific parameters of a particular accident occurrence. This involves determining the potential for off-site release, given the accident circumstances, and the potential or actual source term involved, and classifying the accident based upon these parameters. The other approach involves establishing categories of accidents that can generally be expected to produce certain potential off-site impacts and classifying an accident based upon the type of occurrence rather than the specific parameters. Table 3-1 shows this approach to emergency classifications by accident type. This table is based

on an early risk analysis and is only illustrative of an approach that can be used in developing site-specific accident classifications by categories of accidents. The .2 factor for adjusting the D2PC no deaths concentration is discussed in Section 1.2.3 and is applied to Table 3-1.

TABLE 3-1

CATEGORIES OF CHEMICAL AGENT ACCIDENTS BY TYPE

1. Releases with no immediate consequences - No release above stack standards.

2. Releases with no potential off-site consequences but potential on-site consequences - A source term exceeding standards but with less than a projected .2x No Deaths dose at one half of the distance to the off-site boundary or .5 Km.

3. Releases with on-site consequences and possible off-site consequences - A source term exceeding the projected .2x No Deaths dose at .5 Km but less than the projected .2x No Deaths dose at 1 Km (or the actual distance to the facility boundary).

4. Releases with known consequences in the IRZ - A source term exceeding the projected .2x No Deaths dose a 1 Km (or the actual distance to the facility boundary).

5. Releases with potential consequences in the PAZ - A source term exceeding the projected .2x No Deaths dose at 10 Km.

6. Catastrophic releases with potential consequences beyond the PAZ - A source term exceeding the projected .2x No Deaths dose at 35 Km.

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The primary benefit derived from a real-time or near-real-time perimeter monitoring system is the identification of agent releases in scenarios which do not present a high level of recognition of the initiating event. While such instances are extremely unlikely to provide catastrophic accidents, the potential off-site consequences of an undetected agent release could be significant, given the need for rapid alerting and response for protection of the public.

The benefits of having an accident classification system in place at each fixed site are significant. Such a system establishes a "common language" between on-site and off-site emergency responders and permits a better understanding of necessary responses at all levels. An approach which

derives accident classifications from the specific parameters of a particular accident occurrence will provide the most accurate indicator of potential accident consequences. However, this approach can be relatively time consuming and may delay the classification of an accident unnecessarily. The approach to accident classification based solely on the type of accident (as described in Table 3-1) allows for early classification and response and is desirable, given the potentially short period of time available for response to chemical agent accidents.

The D2PC computer model is currently operational at each of the eight storage sites. The addition of a capability to incorporate ongong meteorological data into the model will add a significant level of reliability to the accident assessment process.

#### 3.2.1.4.4 Conclusions

An accident assessment capability will be established at each fixed site which will provide prompt and effective agent detection and characterization. This will include establishment of an enhanced agent monitoring capability at fixed sites and site perimeters that will allow detection of all agent releases on as near a real-time basis as possible. A consistent accident classification scheme will be established that allows for emergency organization alert, preparedness, mobilization and response to an accident based simply on the type of accident and the general level of seriousness indicated by the accident classification. Supporting predictive systems (dispersion modeling and dose projection) are currently in place at each fixed site to provide timely data for consideration by decision-makers at the time of an accident. The classification system and decision criteria established at each fixed site will be closely coordinated with off-site authorities to ensure recognition of local organizational capabilities and allow for appropriate consideration of off-site circumstances and particular off-site protective action approaches. The function of accident assessment is largely a storage/disposal facility responsibility that will accommodate various off-site considerations in its development.

### 3.2.1.5 Protective Action Decision-Making

#### 3.2.1.5.1 Introduction

The decision to implement a particular off-site protective action in the event of an accident involving the release or the potential release of chemical agents generally rests with the chief elected official(s) in the political jurisdiction(s) involved. In order for such officials to reach appropriate decisions in a short period of time, a system will be developed to facilitate and expedite the decision-making process. Since this decision may need to be made rapidly, this system will provide the necessary information rapidly, on a 24-hour basis. Since such a decision will require an intimate knowledge of the emergency preparedness system, and may need to be made rapidly, elected officials may choose to delegate such authority to another official such as the local Emergency Management Coordinator. Initial determination of protective actions, and recommendations to the affected public by the Army installation, may be desirable due to the need for very rapid response in many scenarios.

#### 3.2.1.5.2 Discussion

The information upon which protective action decisions must be based is available only from emergency personnel at the storage/disposal facility. Thus, the initial step in the process will be to identify the on-site individuals, and their alternates, who have the responsibility and the authority to communicate the necessary information to off-site authorities. The next step will be to clarify the role of the chief elected official(s) in the jurisdiction(s) involved. Elected officials must be directly involved in the decision-making process, but these officials have many other responsibilities and are not always available. Therefore, the authority to make decisions and to implement protective actions may be delegated to the individual in charge of the emergency response program. This person may be the Emergency Management Director, Civil Defense Director, Chief of Police, Sheriff, Fire Chief, etc. The offsite individual(s) who can make such decisions must be available on a 24 hour basis. Ideally, an off-site

Emergency Operations Center which is manned around the clock could receive and act upon facility notifications, however, there is often no such 24-hour notification point. Some arrangement will be established whereby at least one community official with the authority to direct the implementation of protective actions is available to receive and act on storage/disposal facility notifications at all times. Decision-making authority for warning and protective action recommendations in events which preclude off-site contact should be negotiated between the Army and local officials on a site specific basis. Army implementation of immediate protective action decisions may be desirable in situations where rapid response is needed or where local decision-makers are unavailable.

After the appropriate points of contact have been identified at the facility and in the community, communication between the two will be established. There will be a primary communication method and at least one backup system. The most reliable and secure system is a dedicated telephone line between the two locations. Backup systems can include two-way radio, commercial telephone, facsimile machines (for hard copy transmission) and Telex. A detailed discussion of such systems can be found in the Communications component discussion.

Once communication has been established, the specific information to be communicated will be addressed. The type and amount of information to be communicated to offsite authorities will be established in detail and agreed upon by storage/disposal site and offsite officials. From this agreement, procedures and forms can be developed for use at both locations to ensure the timely and accurate transfer of information. The establishment of the exact information that is necessary to facilitate protective action decision-making simplifies the process and reduces time loss at all stages of the process. This includes information gathering, accident assessment, offsite notification, and decision-making. The information necessary for an informed protective action decision includes, but is not limited to, the following: name of communicator, verification number (if commercial telephone is used) or authenticator, time of notification, accident classification, time of accident, brief description of accident, projected impacts, meteorological data and a recommendation for the

implementation of protective actions. Although Army emergency officials at the fixed site cannot compel protective actions for the general public, they are in the best position to evaluate the severity and potential consequences of the accident, so it is vitally important that the fixed site's emergency response plan contain a mechanism for making recommendations for protective actions to offsite officials.

With the necessary accident information in hand, local government decision-makers will have detailed within their plan additional considerations that may impact their decision. Examples of these additional considerations are: weather conditions, highway conditions and the general state of readiness to implement the protective action(s) recommended. All of the considerations which go into the decision-making process will be addressed and resolved in the planning process and included in detailed procedures to allow the most appropriate decision to be made in the shortest possible time.

An emergency classification system can greatly facilitate the implementation of protective actions. The single most important contribution to an emergency classification system is the establishment of a "common language." In this way community officials can react quickly to various emergencies according to established procedures. Activities such as notification, placing emergency services on standby status, mobilizing resources, and implementing protective actions, can all be accomplished on the basis of an emergency classification, rather than specific and detailed information on the hazard involved. The emergency classification declared for an emergency at a storage/disposal facility must be made by facility personnel because they are most knowledgeable of accident conditions and the nature of a potential hazard. A detailed decision/action planning process will be implemented jointly by community officials and facility officials to ensure that a thorough understanding of the roles and responsibilities of each are established.

The process of deciding upon protective actions can be complex and requires the establishment of detailed decision criteria if it is to be accomplished effectively at the time of an accidental agent release. The planning

process must identify and classify those accidents that could occur, and the implications of those various accidents for various areas in all directions from the facility. It should be possible to establish "automatic" protective actions to be taken in certain areas for specific accident classifications, based upon the site-specific characteristics of the emergency planning zones for each site. Additional protective action decisions depend upon the specific circumstances of a release (e.g., type of agent, amount of agent, meteorological conditions, warning/evacuation time available) and will require the development of decision criteria to be applied at the time of a release. Although these are common considerations across all of the stockpile locations, the final protective action decision criteria will be developed specific to each site.

3.2.1.5.3 Alternatives

There are a variety of methods in which a protection action decision-making structure can be developed and forms which it can take. Such structures will be developed on a site-specific and jurisdiction-specific basis, and be responsive to local circumstances and needs. The primary consideration will be the development of a system which is prompt and effective while respecting the legal requirements of the jurisdictions involved.

The primary benefit derived from a well developed and formalized decision-making structure is the prompt determination of appropriate measures and their timely implementation. In certain accident scenarios involving short notice of off-site agent releases, the presence of such a system is critical to the protection of human lives.

3.2.1.5.4 Conclusions

A system will be established at each site which designates both the on-site and off-site authorities responsible for recommending and implementing protective actions. Communications will be established which allow for the

prompt notification of these individuals and/or their alternates. For off-site communities, elected officials should consider designating individuals who are authorized to make protective action recommendations to the public. Once determined, this information will be detailed in implementing procedures. The possibility of Army implementation of immediate responses will be explored and formalized on a site-specific basis.

A standard emergency classification system will be developed for use by on-site and off-site authorities, which will allow community planners to base initial actions on classification levels rather than specific accidents. Detailed protective action decision-making procedures will be established at all storage/disposal sites and in off-site communities. The procedures for on-site authorities will be based primarily on technical considerations and downwind hazard projections. Off-site procedures will further consider on-site recommendations and temper them with factors existing within the community which would impact on a particular protective action.

### 3.2.2 Protective Actions and Responses

The topic of protective actions and responses encompasses all of the activities which can be implemented in order to reduce or eliminate the exposure of a population to a hazard. The various options which can be implemented, their practicality, and effectiveness, will be assessed. Some means will exist to provide warning of a hazard and notification of appropriate responses to the affected population. Special actions may be required in order to implement the appropriate response. Special populations will be identified and consideration given to specific responses for them.

In order to address these issues, the category of protective actions and responses has been divided into five discrete components. These are: Protective Action Options; Public Alert and Notification; Traffic and Access Control; Special Populations; and Emergency Worker Protection. A detailed discussion of each component follows.

#### 3.2.2.1 Protective Action Options

##### 3.2.2.1.1 Introduction

The basic objective in an emergency management program is providing prompt and effective action to protect people from a hazard. Once the basic protective action options are established for a particular program, all other planning elements are developed to support the implementation of those protective actions. There are a variety of protective actions which have the potential of reducing or eliminating exposure by a population to an accidental release of chemical agent. They fall under three general categories: evacuation, sheltering, and individual protection. The administration of antidote drugs, while an important component of the emergency response, is not technically a protective action since these drugs are effective only following agent exposure.

#### 3.2.2.1.2 Discussion

The three basic categories of protective action which are applicable to this concept plan consist of evacuation, sheltering and individual protection.

Evacuation, the removal of individuals from an area of actual or potential hazard, may be precautionary or tactical in nature. A precautionary evacuation is the most effective protective action if it can be accomplished prior to the exposure of individuals to the hazard. A number of factors influence this response, however, including the time required to identify the release, assess its magnitude and potential impacts, and notify responsible authorities; the time for responsible authorities to decide upon evacuation; the time required to alert and notify affected members of the public; and the time required for individuals to clear the affected area. This last item is dependent upon a number of additional factors including time of day, day of week, weather conditions and the existing evacuation route network and loading. A tactical evacuation, in contrast, is an action taken at the time of a hazard and may result in exposure of some or all evacuees to the hazard. In many types of emergencies, however, a tactical evacuation is still the most appropriate response.

An example of a precautionary evacuation is provided by an evacuation in anticipation of a hurricane. Hurricanes are relatively slow-moving storms which are somewhat predictable and thus provide considerable warning time. The evacuation of persons from potentially impacted areas is a very effective response. The concept of a tactical evacuation may be represented by a hazardous materials transportation accident. Such accidents provide virtually no advance warning and often result in a near-instantaneous release of toxic materials. Nevertheless, the evacuation of persons close to the accident site is often the only reasonable protective response, particularly if an explosion hazard or severe respiratory hazard exists.

The concept of sheltering, or shielding the public from a hazard, has many potential modes of implementation. Shelters may be collective (for more

than one person) or individual. Shelters may be existing structures, with or without upgraded protective measures, or may be facilities specifically designed for such a purpose. For sheltering against chemical agents, certain efforts can be highly productive in improving the protection factor of a structure. The Army's Chemical Research and Development Engineering Center at Aberdeen Proving Ground has conducted extensive research on the protection against chemical agents provided by closed buildings.[1,2] Particular emphasis was placed on identifying countermeasures to protect civilians from chemical agents. The results of this and other research indicates that many buildings can provide significant protection against chemical agent vapors, particularly in releases of short duration. The key to sheltering in structures is in knowing when the agent cloud has passed and when the structure should be ventilated (or its occupants evacuated). In a structure which is kept closed for an extended period, the concentration of agent inside will eventually equal the outside concentration, and the protection factor will diminish and ultimately cease to exist[3]. For a dwelling with one air exchange per hour, occupant exposure will be reduced by about one order of magnitude for an agent cloud lasting about 10 minutes[4]. Improvements in the sealing of a building which reduce air exchange rates to one in 8 hours can result in a protection factor of 30*, and an exchange rate of once per 16 hours can produce a protection factor of 60, assuming a vapor cloud passage time of 30 minutes, and ventilation of the structure following cloud passage[3]. Efforts to seal an entire house may not be necessary; efforts to seal one room in a house, particularly an inside (windowless) or basement room, could be done with less effort and result in similar protection factors to those discussed above[3].

Other approaches to improving the protection factor of existing structures include the pressurization of structures with air drawn through activated charcoal filters. Activated charcoal has proven to be a very efficient

*Protection factor is a term which expresses the degree of exposure reduction as a fraction. For example, a protection factor of 30 means that the exposure with protection is 1/30 of the exposure without protection.

filter of toxic gases, particularly higher molecular weight chemicals such as nerve agents. The Army has developed a number of filters for use in protecting persons in vehicles or in field shelters. These include the M48, which is rated at 100 cubic feet per minute (cfm) airflow, the Modular Collective Protective Equipment (MCPE), which is rated at 200 cfm, and the XM49, which is rated at up to 600 cfm and features removable charcoal trays. Similar filters are available commercially. This type of filtration/ pressurization system has the potential of providing a protection factor of 3,000 against agent GB[3].

The third main category of protective action, individual protection, is somewhat similar in concept to sheltering. That is, the basic approach is to minimize exposure of a population or individual to the exposure pathway of an agent. Most individual protective equipment which is considered in this discussion provides primarily respiratory protection. While several of the chemical agents provide a skin exposure hazard as well, it is anticipated that individual protective equipment, if used, would be recommended in conjunction with sheltering. The structure of the shelter, even without infiltration reduction efforts, would provide significant protection against skin exposure to agent aerosols. Thus, an inherent planning assumption is made that the primary exposure pathway to off-site populations is respiratory exposure. Most approaches to protective equipment are individual in nature, although collective systems which provide filtered or bottled air through a manifold system to multiple face masks have been developed. Individual respiratory protection systems include a variety of face masks and protective clothing. In the United States, most of this type of equipment has been developed for industrial safety applications. In Europe, particularly in Sweden and in Switzerland, masks have been developed specifically for the protection of civilians against chemical industrial accidents and chemical weapons. Most of this civilian equipment is designed to meet military protection specifications, which provide a protection factor of 2000-2500 for GB and 10-20 against H. Mouthpiece respirators,

which have been developed in the United States as protective devices to allow chemical industry workers to escape a hazard area, provide a protection factor of approximately 1000 against GB. This device consists of a tube which is held in the mouth and a separate nose clip. It is easily stored and can be put into action very rapidly; however, this equipment requires some physical effort and concentration to maintain a tight seal against the mouthpiece, and is designed for short-duration use while the wearer is escaping a chemical hazard. Thus, the effectiveness of the protection provided by this device could diminish over time, limiting the usefulness of the device.

A different type of mask, developed by the British, consists of a charcoal cloth bag held over the nose and mouth by elastic straps. This facelet mask has a maximum potential protection factor of 1200 for GB and 80 for agent H. The protection provided by this device is limited by the seal against the wearer's face, which is imperfect. It also takes some time to deploy, requiring the attachment of straps and fitment to the head.

Most of the devices discussed to this point would not be effective for infants and young children: adult-sized masks will not seal against a child's face, and the mouthpiece respirator requires a level of concentration which may be beyond a child's ability to maintain. However, a number of devices have been developed which are specifically designed to provide protection against chemical hazards to young children. These devices, manufactured primarily by Scandinavian firms, include a child's hooded jacket equipped with a battery operated blower and charcoal filter; protective enclosures for infants which are equipped with battery operated blowers and charcoal filters; and a protective enclosure for infants with charcoal filter which is ventilated by an adult's breathing through an attached face mask. This latter equipment is not dependent upon batteries or external power.

Another protective action that may be necessary would be actions taken to protect downstream water supplies in the event of a liquid chemical agent spill that enters local waterways. If spilled chemical agent were to reach

water via a drainage ditch or stream, a plume of contaminated water would flow downstream and present a hazard to downstream water users and aquatic life. The areas of concern include the streams and rivers downstream; the shoreline, which could be contaminated with not-yet-dissolved agent (e.g., VX or H; see Table 1-2); and the facilities and land that contact the water or shore. Of special interest are water-supply intakes and water recreational areas. Areas where grazing animals can reach contaminated water are also of concern.

A chemical agent spill that reached water could present an aquatic hazard even though the airborne release from the spill was small. The responses in the latter phases of an emergency would be quite different for this type of release. Conversely, an airborne release might have little impact on water. The two modes of release are likely to differ in terms of the populations and areas affected and the exposure pathway (inhalation vs. drinking water or water contact). In contrast to airborne releases, where the location of the area of impact depends greatly on meteorology, the location of the area of impact for waterborne releases is fixed by the local topography and is known in advance. Therefore, specific measures can be planned involving notification to downstream water users and areas near affected waterways, sampling and monitoring of downstream waterways and identification of alternative water sources for public use.

3.2.2.1.3 Alternatives

In summary, there are three primary categories of protective action for chemical agent accidents; evacuation, sheltering, and individual protection. Evacuation is very effective, particularly if it can be completed prior to exposure. Sheltering in unimproved structures provides minimal protection against agent vapors but does provide aerosol protection; sheltering in structures with improvements to minimize infiltration, or with pressurized filtered air supplies, can be very effective. Individual protection devices in this discussion provide primarily respiratory protection; protective equipment includes face masks, charcoal facelets, mouthpiece respirators, child hoods, and battery-powered or mask-powered infant enclosures. The

decision on which type of protective action, or mix of actions, should be implemented is dependent upon the accident scenario, the population at risk, warning time, and a myriad of other factors.

Implementing a large-scale evacuation requires considerable planning regarding evacuation routes, traffic and access control, and evacuee support. The benefit of these efforts is a more rapid and orderly evacuation, with a lower chance of exposure for evacuees.

The provision of infiltration reduction methods, or pressurized air filtration systems for private residences present several potential problems. The number of residences which would require modification is very large, resulting in a massive program requiring a great deal of time and providing a difficult administrative task. More importantly, this activity would require the modification of private dwellings, requiring the permission of the property owners. The provision of such measures for institutional facilities presents fewer such problems in that they are fewer in number, and may be more receptive to the installation of such systems.

The concept of individual protective equipment involves a variety of types of equipment and material, each with advantages and disadvantages. In an effort to estimate the effective level of protection provided by each device, the percentage of the population which would properly use the device in a way to achieve maximum protection was estimated. This estimate was based on the nature and complexity of the device as well as the level of difficulty presented by its proper use. The devices, their maximum protection factor, the adjustment factor, and their adjusted protection factor are detailed in Table 3-2.

TABLE 3-2
BENEFITS OF INDIVIDUAL PROTECTIVE EQUIPMENT

| Device | Estimated Maximum Protection Factor (GB) | Adjustment Factor | Adjusted Protection Factor |
|---|---|---|---|
| Mouthpiece Respirator | 1,000 | 50% | 500 |
| Civilian Face Mask | 2,000 | 65% | 1,300 |
| Charcoal Facelet | 1,200 | 33% | 400 |
| Child's Hooded Jacket | 2,000 | 83% | 1,660 |
| Infant Carrier (Battery Powered) | 2,000 | 88% | 1,760 |
| Infant Carrier (Mask Ventilated) | 2,000 | 88% | 1,760 |

Based on the tabular data, the facemask offers a significantly higher adjusted protection factor. Each device presents additional concerns. The mouthpiece respirator is easy to rapidly put into use since it requires no special fitment, requiring only that the wearer insert it into the mouth and maintain a seal. This device is thus quick and easy to deploy. The need to maintain a seal with the mouth implies, however, that the effectiveness of this device would decrease over time of use. No data regarding the effectiveness over time are available. The facemask requires fitment and the attachment of straps to hold it in place. It also has many of the disadvantages of any facemask, by not conforming to all head shapes and sizes and by not sealing against facial hair. Thus, there is a sizable portion of the population that would not be able to realize full protection from this device. The child's hooded jacket and the infant carriers appear to be the only devices which are available for infants and children. Of the

two infant carriers, the mask-ventilated model offers the advantage of a lack of need to maintain batteries.

The provision of such individualized protective equipment to the public presents several other potential problems: the persons receiving the equipment must be trained in its use; a system must be established to distribute and maintain the equipment; and finally, careful analysis must be given to the possible reactions of members of the general public to the provision of protective equipment. It is conceivable that such action may result in a greater public perception of risk for the chemical stockpile disposal program than is warranted.

3.2.2.1.4 Conclusions

Evacuation wherever feasible is the protective action of preference. A capability to rapidly implement an evacuation of all or part of the Protective Action Zone will be established in all affected jurisdictions. This capability will be based upon evacuation time studies and detailed traffic and access control planning. In instances where evacuation may be infeasible, additional considerations will be implemented. Infiltration reduction/pressurized filtration systems will be provided for institutional facilities that present evacuation problems due to the nature of their populations or the proximity to the fixed site. Appropriate individual protective equipment will be provided to individuals whose residence or place of employment is located in proximity to the fixed site and who thus may not be able to implement evacuation.

3.2.2.1.5 References

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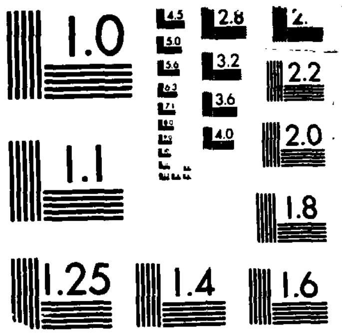


MICROCOPY RESOLUTION TEST CHART

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### 3.2.2.2 Public Alert and Notification

#### 3.2.2.2.1 Introduction

A public alert/notification system which can effectively alert the public within a designated emergency planning zone and provide specific instructions for self-protection, is central to any emergency response program. The system must be capable of warning the public (residents and transients) of public health/safety actions in the event of any emergency requiring specific protective actions. The system generally relies upon two separate and distinct components, alert and notification. The alert component is designed to attract the attention of the public. The notification component communicates instructions to the population at risk.

#### 3.2.2.2.2 Discussion

The alerting component of a public alert/notification system is geared to stimulation of one or more of the senses, usually those of hearing and/or sight. Following the alerting phase, information is communicated in the notification phase. The notification phase may use a variety of methods including the spoken word, written information, interpretation of a signal, and annunciators. At a minimum an emergency notification message will describe the hazard and its consequences, locations that are and are not potentially affected, the timing of the event, the source of the information about these facts and what do so as a result of the threat. Under each of these general categories a number of specific pieces of information reflecting the actual event are needed.

#### 3.2.2.2.3 Alternatives

Audible warning devices are the most commonly used devices for public alerting. Included in this category of attention-getting items are sirens, bells, horns, whistles, public address announcements and other devices designated to produce a signal which is in the general hearing range of the

average human. These are typically designed to produce and emit sound energy at frequencies between 300 and 3,000 Hz at amplitudes below the threshold of pain (130 dB) but at least 10 decibels above the average ambient sound/noise levels of the environment where the risk population is located. The primary "alert" tone or frequency of the device should not mimic any other popular sound within the intended alert area, that is, tones with frequencies closely related to sounds or noise generally found in the environment are to be avoided. These include air horns of trains and trucks, school bells, noises from machines, turbines, etc.

Outdoor sirens are one of the most commonly used systems for accomplishing wide area alerting. Sirens are manufactured with a wide range of power and functional options for application to particular needs and circumstances. A variety of siren tones are available. However, experience has shown that the broad use of different tones for different purposes has not been particularly effective. Even with an extensive public awareness program, a large portion of the public will not be able to clearly recognize different tones, or will not remember what the different tones signify. Several types of sirens are available with public address capabilities. Public address capabilities have been used in locations where immediate recognition and specific responses must be elicited. Existing sirens within a community often should not be integrated into the public alert/notification system. A siren at a local fire station which is sounded frequently for the specific purpose of fires will not likely be recognized by the public as more than a fire siren. The number of sirens required for effective coverage can be radically affected by terrain, vegetation and other characteristics of a particular location. The effectiveness of siren systems can also be impacted by the amount of insulation in homes and by high background noise levels, such as heavy industrial sites or busy highways.

Visual alert devices are less commonly used. These devices include strobe lights, rotating beacons, flags, lighted display boards (light matrix), flares, sky rockets, and other visually attractive devices. Like the audible devices, care must be exercised so as not to have an alerting device confused with other items commonly found in the environment.

Notification methods may include the use of commercial broadcast radio stations as a part of the Emergency Broadcast System or combinations of the broadcast radio system, television stations, cable television systems and other mechanisms such as the National Oceanic and Atmospheric Administration radio system. With the use of a separate alert mechanism and notification phase, the public becomes aware of an emergency by means of one or more of the alert (attention-getting) mechanisms. Notification is then accomplished via one or more of the commonly available information transfer avenues.

The aforementioned methods of alert and notification rely upon two separate and distinct "systems" to attract the attention of the public and then provide information. This two step process requires the public to be fully cognizant of the process. That is, the public must know that when "alerted", they are to seek information from a source such as the Emergency Broadcast System or one of its components.

There are also devices available that accomplish both the alert and notification function. The three most prevalent combination devices are alert radio receivers (tone and voice), simultaneous activation of telephones within a given defined area (tone and voice), and interruption of programming on cable television systems. One additional technology is rapidly emerging in this country and has had success in Germany. The Public Information Notification System (PINS) utilizes a subcarrier of the standard FM radio channel to provide an alert signal and emergency information. Some of the PINS equipment available for public users includes decoders located in automobile radios which can automatically change the "channel" selected to the one with the emergency information. Some models will stop the tape mechanism (if selected) and provide the alert and information, or turn the radio on if it is off. This system is becoming more readily available in the United States but will not be available in significant numbers of private vehicles for several years. The system can be configured to activate home/industrial receivers or act as a "back-bone" system supporting a host of other technologies.

A variety of tone alert radio receivers are on the market today. This type of radio receiver generally operates on normal house current (AC) and most models have a battery backup so that they will remain operable during a power outage. The radios are designed to be quiet until activated by a radio signal. When the signal is received, a loud alerting signal precedes the emergency instructions. These devices are generally used either in sparsely populated areas where siren coverage is impractical or as a redundant system for schools, hospitals, nursing homes, etc. Maintenance and accounting for the devices may be a concern if used in private residences. In addition, groups of individuals not within hearing distance of the radio when it is activated will not receive the emergency alert/notification quickly, if at all.

A telephone alert/notification system has been developed which allows emergency management officials to simultaneously ring all of the residential and commercial telephones in a particular area, and then deliver emergency instructions. This type of system is installed in telephone company switching offices and can be activated in a variety of ways. This system can be utilized as a notification method for emergency response personnel or as an alert/notification system for a wide area. The drawbacks to this type of telephone based alert/notification system are that individuals without a telephone cannot be alerted via this method, and that groups and individuals not within hearing distance of a telephone will not receive the emergency alert/notification quickly, if at all.

Another type of telephone alert/notification system utilizes a personal computer as an automatic dialer. This system can be programmed to dial numbers sequentially and give recorded instructions. Each call takes approximately 20-25 seconds. The system can be set up for multiple lines. The system relies on the dial-up method and is ineffective for busy lines and non-answers, although it can be programmed to re-try those numbers for a designated period of time. This type of telephone system is most effectively used as a redundant method of alert/notification for special facilities or population groups.

Commercial radio and television stations should be a common element in all alert/notification systems. Virtually every household in this country has a radio or television set, usually several of each. Radio and television stations have historically been cooperative and may welcome the opportunity to participate in an emergency warning system, because of genuine concern for the community in which they are located and because of FCC public service and license requirements. Radio and television stations usually can only provide the notification portion of the alert/notification system. Once the public is alerted by other means, radio and television can deliver detailed instructions, repeated regularly and in as much detail as necessary. A local radio station should become the focal point of emergency public information, supplemented by local television stations where available. Public education programs should be intensive and should stress which stations can provide emergency information.

In areas having a high rate of cable television subscription, the use of cable television based notification systems may be used as a redundant system. Equipment can be incorporated into the local Cable TV systems which overrides the video broadcasts on all cable system stations. This addition to other systems can enhance emergency notification by reaching viewers who may not have received the emergency message by other means.

In summary, the systems for public alert/notification which are relevant to this plan include sirens, tone alert radios, automatic telephone dialing systems, the mass media, and combinations of these devices and systems.

The degree of reception of a warning signal, or its "penetration", varies according to the system used and the particular activity of the intended audience. This, in turn, is largely a function of time of day.[3] For example, when persons are outdoors, they are very likely to hear a siren, but very unlikely to hear a tone alert radio. Conversely, persons at home asleep are less likely to hear an outdoor siren than a tone alert radio or telephone.

Probabilities have been assessed, by warning system, of an individual being warned before the arrival of a potentially lethal agent concentration at various downwind distances for different meteorological scenarios[3]. The study indicates that a combined system, emphasizing indoor and outdoor warning, is the most effective warning system for the Immediate Response Zone. Within the rest of the Protection Action Zone, given the greater warning time available, it appears that some combined system for specific applications, such as population centers, institutions and other special facilities, coupled with media, EBS and possibly route alerting, would provide effective warning.

### 3.2.2.2.4 Conclusions

A comprehensive alert and notification system, providing both outdoor and indoor notification, will be implemented within the Immediate Response Zone for each site. These systems will consist of sirens for outdoor notification, coupled with telephone and/or tone alert radio systems for indoor and institutional warning.

A combination of systems will be implemented for the remainder of the Protective Action Zone at each site. A telephone or tone alert radio system will be provided to all institutions and major employers. Tone alert radios will also be provided for residences which are isolated as well as for visually impaired persons. Modifed tone alert radios utilizing a high intensity light or mechanism to flash room lights will be provided to hearing impaired individuals. Sirens will be installed within community centers and recreation areas within a 10-20 Km radius of the site. Beyond 20 Km, the media, the EBS system and possibly route alerting will provide adequate warning.

### 3.2.2.2.5 References

1. Sorensen, J., 1987. Evaluation of Protective Action Effectiveness for Chemical Weapons Accidents, Draft, Oak Ridge National Laboratory.

2. Federal Emergency Management Agency, 1985. Guide for the Evaluation of Alert and Notification Systems for Nuclear Power Plants, FEMA-REP-10.

3. Sorensen, J., and G. Rogers, 1987. Warning Diffusion Processes: Implications for Chemical Disposal Emergency Planning, Draft, Oak Ridge National Laboratory.

### 3.2.2.3 Access and Traffic Control

#### 3.2.2.3.1 Introduction

Whenever an emergency situation has occurred or is imminent, one of the first actions to be taken by emergency management officials is to control access into the affected area to prevent additional, unnecessary exposures to the hazard. On the surface this activity appears to require little planning; however, in practice it can become considerably more complicated.

In any mass evacuation, traffic control can play a crucial role in the speed and efficiency of the evacuation. This becomes a critical issue in urban areas, where the potential for traffic congestion is greater. Careful planning of evacuation traffic routing, coupled with the siting of traffic control points at potential traffic congestion areas, is essential.

#### 3.2.2.3.2 Discussion

The availability of adequate manpower to implement access control within a short time may present a problem in non-urban areas. While there is a large potential pool of law enforcement personnel which can be mobilized over approximately a 2 to 8 hour period (i.e., State Police, National Guard), plans will address the need to mobilize local resources for the immediate response phase.

In planning for manpower needs, experience has shown that non-uniformed personnel are less effective at access control points than "official" law enforcement personnel. The authority that accompanies the uniform is often needed at access control points. Access control points must be carefully planned at locations which allow space for turn-around, or a location which allows traffic to continue on a route that takes them back out of the restricted area. These points will be designated in advance in order to allow the immediate dispatch of personnel, and pre-emergency identification and commitment of resources. If any of the designated locations are in or near another local government jurisdiction, agreements will be arranged

for the use of uniformed officers from the other jurisdiction. Training is required for personnel at access control points in order to familiarize personnel with policies regarding such issues as residents attempting to return to homes within the restricted area and workers attempting to report to their jobs. A household member, driving the only family car, generally will want to return to his home. If he is not allowed, his family may be without transportation if an evacuation is ordered. Some workers are essential under any circumstances. Many manufacturing/storage facilities (i.e., chemical, petrochemical) simply cannot be abandoned, for to do so might create an additional hazard. Such policy issues will be resolved during the planning process. Training is also required in the proper use of protective equipment by traffic control personnel.

Access control points may also be unmanned, using barricades to prevent entry to a restricted area following an evacuation. Since this approach prohibits all access, including individuals who should be permitted access, it will be limited to secondary roads carrying relatively light traffic loads. Those access control points which are selected to be manned will be indicated on a map within the Emergency Operations Center (EOC) and smaller hand-out maps prepared for field personnel, including access policies and diversion routes.

The availability of adequate manpower within a short mobilization time may present a challenge. Traffic control, however, is less dependent upon the use of uniformed law enforcement personnel for effectiveness than is access control, since traffic controllers are not placed in a strictly security function. Manpower needs in traffic control can be minimized by judicious use of traffic control devices (barricades, traffic cones, flares).

The preparation of evacuation time analyses can be beneficial in identifying potential traffic congestion points, identifying the most efficient routing for evacuation traffic and prioritizing locations for placement of control points. Local law enforcement officials deal with traffic congestion on a daily basis and can provide great insight into traffic problems within the community.

Traffic control points are best designated as part of the planning process and the resources (manpower, vehicles and equipment) necessary for their operation identified. Locally available resources should be identified and committed in advance to specific points, in order to allow immediate dispatch. Mutual aid resources from adjacent jurisdictions should also be identified and their input and commitment gained. As indicated above, the use of sworn officers in uniform is less critical in this task; non-traditional personnel such as volunteer or career firefighters and civil defense staff, and individuals such as fire police and auxiliary police may be excellent traffic controllers.

As with designated access control points, traffic control points should be indicated on EOC maps and clearly labeled with an understandable nomenclature.

3.2.2.3.3 Alternatives

There are few alternative approaches to access control. The primary variable is the availability of personnel. There are a number of alternative approaches to supplementing manpower, including mobilization of off-duty and auxiliary police, mutual aid from other adjacent jurisdictions, State Police, National Guard, and possibly military police personnel.

The primary alternative in implementing a traffic control program is the source of personnel. There are a variety of potential sources for traffic control personnel, as discussed above. The resolution of this issue will be done on a site-specific basis.

The implementation of a well designed traffic control plan can have a significant impact on the flow of traffic in an evacuation, resulting in a more rapid evacuation time and reduced exposure of evacuees to the hazard. The completion of detailed evacuation time estimates can provide valuable input into the protective action decision-making process. Further, some computerized traffic flow models, such as the Interactive Dynamic Evacuation (IDYNEV) model, which is an integral part of FEMA's Integrated Emergency

Management Information System, will provide not only evacuation time estimates for various scenarios (time of day, season, weather condition) but will also support the development of evacuation routing and access and traffic control information.

3.2.2.3.4 Conclusions

Site-specific plans and procedures will be developed that designate access control points around all zones where protective actions may be taken. These points will be capable of completely restricting ingress if necessary. The necessary resources (manpower, vehicles, barricades, communications equipment) to immediately activate these points will be identified and committed. Provisions will be established for long-term (8 hours to several days) activation of access control points, including the designation of necessary resources. Policies regarding who is permitted ingress to a restricted area will be formalized as part of the site-specific planning process and publicized to all access control personnel. Detailed maps depicting the location of access control points and assigning a clear nomenclature will be developed and maintained in all local EOCs, the Army site EOC, and in the headquarters of all responding organizations (i.e., State Police, National Guard).

Plans and procedures will designate posts for the purpose of directing evacuation traffic from all areas within the protective action zone. The necessary resources to activate these posts will be identified, committed and assigned in advance. Detailed analyses of traffic flow patterns and evacuation time studies will be used as a basis for traffic control point designation. Detailed maps depicting traffic flow and traffic control points will be developed and maintained in all local EOCs, the Army site EOC and at all responding organization headquarters.

### 3.2.2.4 Special Populations

#### 3.2.2.4.1 Introduction

In the development of an emergency response program, it is necessary to go beyond those measures which offer protection only to the majority of the public. There are individuals and groups both in and out of institutions who require special consideration in the planning process. These special population groups include, but are not limited to, the hearing impaired, mobility impaired, children in preschool facilities, school children, hospital patients, nursing home residents, individuals in correctional facilities, individuals living at home who require special transportation for evacuation due to medical conditions, persons with chronic medical conditions which would make them particularly susceptible to agent exposure, and that portion of the general population which does not own or have access to an automobile. The elderly constitute a special population group to the extent that they include persons who are hearing impaired, mobility impaired, and nursing home residents.

#### 3.2.2.4.2 Discussion

The first and perhaps the most difficult of the tasks involving special populations is the identification of such individuals and groups. Institutionalized populations are generally easy to locate, however, individuals who need special consideration and are not institutionalized are sometimes very difficult to identify. Planners will work closely with social service agencies at the state, county and community levels. While the need for confidentiality will generally prevent such agencies from providing direct information, they are usually quite sincere about providing questionnaires and referral information to their clients, allowing them to identify themselves to planners. The lists of individuals and the arrangements made on their behalf will be maintained at the local Emergency Operations Center (EOC) and clearly stamped "Confidential" with access restricted only to those persons who have a need to know.

As a part of the community public awareness program, mass mailings containing information on "what to do in an emergency" will be implemented A "special needs" postcard or questionnaire will be included in this mailing to allow individuals to respond if they believe they have a condition which will require special consideration during an emergency. Historically, the response to this type of mailing has been significant.[1] Direct follow-up to verify the special need is vitally important. A very large percentage of responses may likely be from individuals who actually do not need special consideration, usually due to a lack of understanding of what constitutes a "special need". In addition, some of the responses will be from individuals already listed from other sources. Such surveys will be repeated at least annually.

In the hearing impaired category, special consideration will be necessary for alert/notification. This category can be limited to those individuals who live in a household without unimpaired family members, or where the hearing impaired person is alone the majority of the time. These cases will be relatively few in number even in more populous areas and can be effectively dealt with in several ways without great expense. Tone alert radios can be altered to include a light in addition to the alert tone and the television portion of the emergency public information system can include printed as well as oral instructions. Some of the hearing impaired will have a telephone equipped with a Teletype Device for the Deaf (TDD) that allows printed communications from point to point via commercial telephone lines. This device either displays the communication on an LED display or a printed hard copy. These devices could be included in the alert/notification system with the addition of a TDD in the local emergency operations center. Individuals who are both hearing-impaired and sight-impaired will require additional efforts.

The identification of non-institutionalized persons who have a mobility impairment will be necessary in order to accurately assess the overall requirements for transportation resources and personnel requirements. Many of the mobility impaired will not require outside assistance for transportation but may require special consideration in terms of mass care

accommodations in the event of an evacuation. The availability of handicapped facilities in buildings to be used as mass care centers will be noted and mobility impaired individuals directed to appropriate facilities.

It may be found that there are individuals within the community who are not institutionalized but have a medical condition which may require ambulance transportation, specialized medical care in the event of an evacuation, or specialized respiratory protection. These cases, if any, will be identified and included in special arrangements made at hospitals outside of the Protective Action Zone as well as arrangements for medical care during an emergency.

Schools, child care facilities and that portion of the general population not having access to transportation will be considered in assessing the overall need for transportation resources. The arrangements for providing transportation to these groups will be widely publicized as a part of the public awareness program. Special attention will be given to educating parents with respect to the arrangements that are being made for the protection of school children. A major logistical problem could be presented by parents attempting to pick up their children at schools as an evacuation is being undertaken. This problem could be lessened if parents were confident that their children were being cared for and they knew where to find them after the evacuation has taken place.

Hospitals, nursing homes and correctional facilities within the Protective Action Zone present the greatest challenge for planners. Highly detailed facility plans are necessary if protective actions are to be implemented successfully in the event of an accident involving the release of a chemical agent. Nursing homes present primarily a transportation problem. It will be ascertained in advance approximately what percentage of the facility census would require ambulances, wheelchair equipped vans, buses, etc. Generally these numbers will be reasonably accurate regardless of turnover of residents. Many such facilities routinely classify patient transportation needs as part of their initial admission workup and can

access this data very quickly. Correctional facilities will present significant problems in balancing protective responses and security consideration.

#### 3.2.2.4.3 Alternatives

There are a variety of methods which can be employed to identify special populations and determine their needs. These include contact with human service agencies, schools, health care providers, churches, advocacy groups, and fraternal organizations, and surveys which are mailed to all homes within a planning zone and followed up directly. The primary benefit to be derived from such efforts is the identification, and ultimately the protection, of special needs populations. Such populations can comprise a significant component of the community and, particularly in the case of schools and health care facilities, are often highly visible and of high concern to the community.

#### 3.2.2.4.4 Conclusions

Individuals who may require special consideration in the event of an emergency will be identified, their needs assessed, and the appropriate resources identified. Information on persons with special needs and institutionalized persons will be updated annually. Special provisions will be implemented to permit the alert and notification of all potentially affected hearing-impaired persons. Mass care facilities which are accessible to handicapped persons will be identified. Specific plans and implementing procedures will be established for all institutional facilities within the protective action zone, including schools, colleges, hospitals, nursing homes and correctional facilities.

#### 3.2.2.4.5 References


1. U.S. Nuclear Regulatory Commission, Atomic Safety and Licensing Board, 1985. In the Matter of Philadelphia Electric Company, Limerick

Generating Station, Units 1 and 2, Third Partial Initial Decision on Off-Site Emergency Planning, LBP-85-14, Docket Nos. 50-352-OL and 50-353-OL, pp. 33-37.

### 3.2.2.5 Emergency Worker Protection

#### 3.2.2.5.1 Introduction

Many of the emergency preparedness and mitigation procedures described in this concept plan require the deployment of emergency workers in field activities. While some of these activities (i.e., access control) would be unlikely to expose emergency workers to a significant risk, others (i.e., emergency medical services) may present emergency workers with agent exposures. Therefore, emergency workers will be provided with appropriate protective measures.

#### 3.2.2.5.2 Discussion

Many emergency workers such as firefighters and rescue team members already have protective equipment in the form of heavy "turnout gear" and self-contained breathing apparatus (SCBAs). While no known research has been conducted on the degree of protection against chemical agents provided by such equipment, knowledge of agent effects implies that heavy clothing covering exposed skin and a totally closed air supply would provide some degree of protection. Many communites also have, or are developing, hazardous materials response teams. Such teams generally are equipped with protective clothing and breathing apparatus which would provide a high degree of protection.[1] Unfortunately, most emergency workers such as police, emergency medical, and civil defense personnel do not have access to such equipment.

The Army has developed, and stockpiles, clothing and equipment which provides an extremely high degree of protection from agent exposure. Such protective gear includes undergarments, exterior clothing and filter masks.[2] This equipment requires training for its operation and provides several fitment concerns as well. For example, in order to obtain a totally airtight seal on the mask, the wearer can not be bearded. Clothing and equipment which provides a high degree of protection is available from a variety of commercial vendors, both domestic and foreign, as well. Some of

this equipment has been designed for use by civilian personnel in the event of an accident or enemy attack and requires little or no prior training for its use.[3]

The Army and commercial vendors also have produced a variety of methods for the self-administration of nerve agent antidote drugs. These antidotes are designed for self-administration by individuals trained in the recognition of agent exposure symptoms. These kits are routinely provided to military personnel who may be exposed to chemical agents. However, the legality of providing such kits to civilian emergency workers may vary. In any case, personnel designated to receive such kits must receive prior training in agent recognition, symptoms of exposure, administration and dosage, and contraindications.

#### 3.2.2.5.3 Alternatives

There are a variety of types of protective equipment already available to local civilian emergency workers such as fire/rescue personnel and hazmat teams. However, no data are available regarding the effectiveness of such equipment against chemical agents. Consequently, until civilian equipment can be certified as acceptable, devices designed specifically for chemical agent protection are the only viable alternative.

The protective equipment deployed by the Army for chemical agent protection provides an extremely high level of protection. In addition, some equipment is available commercially which has been designed specifically for protection against chemical agents. This equipment has the benefit of being designed for use by civilians and may be somewhat easier to deploy without extensive training.

#### 3.2.2.5.4 Conclusions

All civilian emergency workers who may be exposed to chemical agents as a result of their assignment will be provided personnel protective equipment. This equipment will include protective clothing, breathing apparatus, agent detection equipment, and agent antidotes. Emergency personnel will receive

the necessary initial and refresher training to allow tnem to use the equipment effectively and safely. Unless restricted by law, emergency workers will be provided with auto-injection devices for the self-administration of nerve agent antidotes, and training will be provided in their use. These self-administration kits will not be predistributed to individual workers, but maintained in a secure manner at their organization's headquarters and distributed at the time of an emergency. Provisions will be established for the decontamination of all off-site emergency workers.

3.2.2.5.5 References


1. Hazardous Waste Operations Emergency Regulations. Occupational Safety and Health Administration 29 CFR 1910, Appendix A.

2. Department of the Army, 1978. Chemical Accident Contamination Control, FM 3-21, Chapter 3.

3. "Stockholm Symposium: State-of-the-Art Designs and Discourse," 1986. NBC Defense and Technology 1(4), pp. 52-57.

### 3.2.3 Emergency Resource and Information Management

In addition to those activities which are required to directly implement a protective action, there are a number of parallel, but essential, actions which are critical to the success of an emergency response. These include the provision of emergency medical care, transportation for those individuals without access to personal transportation, the provision of a wide variety of resources from within the affected community(ies), the provision of prompt and accurate information to the public, and the provision of needed support to evacuees including temporary accommodation.

#### 3.2.3.1 Emergency Medical Services

##### 3.2.3.1.1 Introduction

The topic of emergency medical services (EMS) addresses both the prehospital emergency care system and hospital-based emergency care. EMS is a critical component of any emergency preparedness program. The system must be able to expand to accommodate victims of an emergency while maintaining its level of service to the community at large. In addition, EMS providers may be called upon to assist in the evacuation of health care facilities or special populations in the affected area.

##### 3.2.3.1.2 Discussion

Every community is served by some form of emergency medical service, although the quality and quantity of such service varies widely. In general, areas with a relatively high population density, or areas adjacent to urbanized areas, will be served by a more extensive EMS system. Rural areas are less likely to have a well developed, tiered EMS system with extensive personnel, equipment and facility resources; however, the federal effort in EMS systems development during the 1970's did result in the creation of some extensive EMS systems in rural areas.[1]

The quality of existing mass casualty planning generally is directly related to the type and caliber of EMS system which serves the area. The more sophisticated local and regional EMS systems usually have invested considerable time and effort in the development of local and regional mass casualty/disaster plans. Such plans can serve as an excellent base for planning the EMS response to an off-site release of chemical agents. Again, rural areas with a lower population density are less likely to have such plans. The relationship between low population density and less developed EMS systems may not hold true at the state level; a rural area located within a state which has large urban areas may be served by an extensive and sophisticated state-level EMS system.[2] The availability of adequate EMS resources, particularly in rural areas, is likely to become a concern in the site-specific planning process.

There are additional issues which must be addressed in EMS planning. These include the provision of agent antidote drugs by EMS personnel, and training for medical providers. The drugs which are appropriate for treatment of agent exposure cases are prescription drugs, which presents a security and control issue. Many of the emergency medical response personnel serving the off-site areas will not be trained and/or legally authorized to administer pharmaceuticals. For existing Advanced Life Support (ALS) EMS providers, who are authorized within strict limits to administer certain pharmaceuticals, new standing orders and medication protocols will be needed. Agent response protocols and procedures must also be integrated into the existing ALS medical command structure.

The Centers for Disease Control are exploring the legal environment for agent antidote administration in the affected States and have identified alternative approaches to this issue, including potential legislative efforts to train and certify non-medical personnel to administer antidote drugs. The concept of pre-distributing antidote drugs to the general public within potentially affected communities has potential benefits; however, the problems of legal authority, training, security, and liability combine to render this option problematic. All stockpiled drugs will, therefore, be kept in the control of medical personnel, including local physicians,

hospitals, health departments, and authorized prehospital EMS providers. The protocols and antidotes for agent exposure treatment are not well publicized or commonly known; in order to be effective, caregivers must receive appropriate initial and refresher training. Training must also address self-protection and contamination control issues. The Centers for Disease Control are currently developing training materials for medical personnel.

### 3.2.3.1.3 Alternatives

There are a variety of alternative approaches to solving the problem of sufficiency of local EMS resources for a disaster response. These include:

- Statewide EMS resource planning, in which a state-level entity has the capability to mobilize and coordinate local and regional EMS resources. An example of this approach is provided by the Maryland Institute for Emergency Medical Services Systems (MIEMSS) and its SYSCOM resource allocation model.

- Identification of existing community resources which are not normally utilized as part of the EMS system but which have the potential to serve in an EMS capacity in a disaster. For example, local health departments, home health agencies and social service agencies are sources of additional personnel with valuable skills. Nursing homes, schools and churches are potential sources of facilities which could be pressed into service as emergency treatment facilities. School buses, transit buses, charter buses and trucking companies are all potential sources of emergency medical transportation.

- Mobilization of federal EMS resources through the National Disaster Medical System. While mobilization and transit times would tend to lessen the effectiveness of such resources as first responders, they could play a critical role in a "secondary" response phase lasting from several hours to several weeks after a major accident.

- Efforts to mobilize military resources to supplement and relieve civilian EMS providers. Potential approaches to mobilizing military medical resources could include the identification of Army Medical Treatment/Chemical Agent Teams at the site as well as at other military facilities in the region; activation of the Civilian-Military Contingency Hospital System (CMCHS) for follow-up care and referral of victims; or the development of a medical rapid deployment force using military personnel and transportation resources to deploy military medical personnel and equipment to the accident site, similar in concept to the National Disaster Medical System.

- Augmentation of existing local EMS resources (personnel and equipment) as part of the site-specific program development and complementation effort.

The primary benefit which can be realized from a functional emergency medical disaster (mass casualty) plan is the saving of lives. While the basic emphasis of an emergency response program is the prevention of injury, it is vitally important that a capability exist to provide prompt medical care to casualties in an effort to prevent them from becoming fatalities.

3.2.3.1.4 <u>Conclusions</u>

All potentially affected off-site jurisdictions will have an EMS system in place. This system will be capable of expanding to provide services to chemical agent accident victims. This expansion capability can best be established through a combined effort involving regional/statewide mass casualty planning, nontraditional providers, mobilization of national disaster medical resources, and mobilization of military medical resources, with the emphases decided on a site-specific basis. EMS planning will include both hospital and prehospital providers.

Agent antidotes will be stockpiled by all legally authorized entities, and protocols developed for their administration. Provisions will be made at

relocation facilities for emergency medical treatment of evacuees and referral, if necessary, to definitive health care facilities. Training on chemical casualty care will be provided to all medical personnel.

Better integration of the existing on-site Chemical Accident/Incident Response and Assistance (CAIRA) plans with off-site EMS mass casualty plans may be needed. The current plans, developed somewhat autonomously, may depend upon the use of the same resources for divergent purposes. For example, a hospital which is designated by the CAIRA plan as a treatment facility for on-site personnel exposed to chemical agents may also be designated in off-site EMS plans as a regional trauma center which would be expected to accommodate civilian victims of the same agent release. A potential conflict may exist in which a hospital may be serving as a medical resource and at the same time implementing protective actions for its patients and staff.

Existing regional or local mass casualty plans will be modified and expanded to integrate specific response protocols which are appropriate to an off-site agent release.

Provisions will be made to mobilize all available health care personnel in response to an accidental agent release and deploy them appropriately. Training will be provided for all medical personnel who may be involved in the EMS response. This training will address medical agent symptoms and diagnosis, treatment of agent exposure, self-protection and decontamination.

#### 3.2.3.1.5 References


1. Grottenthaler, J., 1984. "Prehospital Emergency Medical Service: Observations on Rural Volunteer Advanced Life Support," The Guthrie Bulletin 54(1), pp. 31-37.

2. Grottenthaler, J., et al, 1978. "EMS Development in Pennsylvania: An Overview", Emergency Medical Services.

### 3.2.3.2 Transportation

#### 3.2.3.2.1 Introduction

Evacuation can be an extremely effective protection response. Consequently, planning must be undertaken to ensure that transportation resources are available or can be quickly obtained for the various groups needing them.

#### 3.2.3.2.2 Discussion

There is a certain percentage of the population who do not own an automobile or have access to one. This population will be identified and arrangements made for the use of buses for transportation. More populous areas generally have a public transit system to call upon for buses, but in less populous areas school buses are the only practical vehicles available. Radio linkage between the EOC and bus operators is desirable in order to communicate updated emergency routing information. Planners must consider the possibility that an accident could occur during school hours or when buses have students in transit. Since this possibility exists, the buses for schools within the EPZ cannot be counted on for other use in an evacuation. Further, it will be determined whether schools within the EPZ can be emptied by each bus making only one trip. If not, additional buses and drivers will be necessary just for schools. Once vehicles have been identified which could be used to assist both school and general population evacuations, further investigations will be undertaken to identify additional needs. Potential areas of need beyond those already identified include nursing homes, hospitals, correctional facilities and child care facilities (day care centers, kindergartens). Many larger child care facilities do not own vehicles with sufficient capacity to transport all the children in their care.

The presence of hospitals and nursing homes within the PAZ presents a much larger and more difficult problem to solve. Rarely does any non-metropolitan area have sufficient ambulances to carry out the evacuation of hospitals and nursing homes within a short period of time. Additional

sources of buses and vans which can be converted to accommodate such patients must be located and agreements signed for their emergency use. The communities around each site are different, with different transportation problems requiring unique solutions.

3.2.3.2.3 Alternatives

There are few viable alternatives in this category. The potential transportation needs must be determined, locally available resources assessed, and unmet needs identified. Additional resources to satisfy unmet needs must be identified from other sources and confirmed via support agreement.

3.2.2.3.4 Conclusions

Transportation needs for all transportation-dependent populations will be identified and the necessary resources (vehicles and drivers) confirmed. Detailed procedures and priorities will be established which govern the mobilization and utilization of various transportation resources. A public information program will advise citizens of transportation procedures. Specific routes for incoming and departing vehicles will be designated and staging areas established. Maps to route incoming vehicles on pickup routes or to special facilities, and from special facilities (such as hospitals) to host facilities will be developed.

### 3.2.3.3 Community Resources

#### 3.2.3.3.1 Introduction

Any emergency response program is dependent upon the resources necessary to carry out its activities. While resources such as communications equipment, vehicles and protective gear can be acquired and stockpiled, many other resources such as personnel, transportation resources (buses and ambulances), and mass care centers already exist within the community and can be identified, committed and confirmed as part of the planning process.

#### 3.2.3.3.2 Discussion

There are a wide variety of resources existing within most communities which can be of value in an emergency response. Most local emergency preparedness programs rely extensively on volunteer staff. A wide range of transportation resources, including school buses, coach buses, vans, trucks and ambulances, is generally available. Facilities for use as reception centers, mass care centers and medical treatment centers can be identified within a local area.

As part of the site-specific planning process, resource needs will be defined. The logical next step in the planning process is the identification of existing resources within the community which can meet identified needs. A resources directory will be prepared and maintained current for each jurisdiction. This inventory may be kept in notebook form or on a computer, as long as it is current and accessible at the time of an emergency.

Traditionally, the commitment of resources is obtained through a letter of agreement. In general, resources which will be deployed for off-site responses will be committed to the jurisdiction in which they are located, or in which they will respond. Such agreements will be updated on a regular basis.

### 3.2.3.3.3 Alternatives

There are no viable alternative approaches to this component, save for the direct acquisition of all needed resources in advance, which is both impractical and unnecessary.

The primary benefit achieved through this effort is the pre-emergency identification and commitment of needed resources for a response. It is critical, given the potentially rapid nature of an agent accident, that resources be readily available.

### 3.2.3.3.4 Conclusions

All off-site emergency response plans will analyze and identify the resources needed to implement the plan and assess the extent to which they exist within the community. Each off-site emergency management agency will maintain a current resource directory with details on the location, extent and means of access of resources.

Formal support agreements or memoranda of understanding will be established for all resources involved in the emergency response program. The support agreements will outline the emergency measures to be provided by each party and the mutually acceptable criteria for their implementation. Emergency response agencies that are established and/or authorized by federal, state or local legislation do not typically require written agreements but will sign-off on formal plans as an indication of acceptance and concurrence with their provisions.

Agreements should already be in existence between fire companies (mutual aid), and between local American Red Cross chapters and local government. Any other agreements developed will ensure that all parties involved are knowledgeable of their responsibilities and specify any limitations that apply to their involvement. Some agreements may require the recognition of liability for damages incurred as a result of the

commitment of certain resources or the payment of certain costs incurred in committing resources to emergency response.

A standardized format for letters of agreement will be established to facilitate the process of obtaining and maintaining such documents. Agreements will then be incorporated as an annex of the Emergency Response Plan or by reference to a document file. Agreements will be renewed annually to accommodate changes in agency function, administration, or personnel changes. This activity will be accomplished at the same time as the annual review of the Emergency Response Plan.

#### 3.2.3.4 Public Information

##### 3.2.3.4.1 Introduction

The effectiveness of any emergency response program is dependent on the degree to which the general public is aware and involved in the program. This is especially true when the program includes response to an accident involving hazardous chemicals. The options for community response and the time available to exercise these options could be very limited, which reinforces the need for the public to fully understand the actions that need to be taken. The public will be educated as to the nature of the threat and the protective actions that can be taken. This will be accomplished through an effective public information program.

The emergency public information function in emergency management programs includes three distinct elements: 1) public awareness, 2) public education, and 3) emergency public information. The public awareness element involves informing the public of activities that are taking place in the development and implementation of an emergency preparedness program. The involvement of both the general public and officials is an important component of any preparedness program. The public education element involves the direct provision of knowledge to the public. This can be accomplished by direct actions such as the mailing of brochures and electronic media public service announcements. Indirect methods are also effective and can consist of activities to educate the media and, though them, the public. Training programs involving emergency responders such as police, fire, emergency medical, public works and special facilities personnel also tend to serve as good vehicles for educating the public. Emergency response personnel represent a significant portion of the community and come into daily contact with an even larger portion of the total population. If emergency response personnel are convinced that the emergency management program will work well, they will convey this confidence to the community. The emergency public information function is an extension of the public alert/notification system. Once the public has been alerted to the emergency and instructions have been given, it is a necessity for a system to continue to provide the

latest and most accurate emergency information. This function is critically important when used in conjunction with an "alert-only" system such as sirens.

3.2.3.4.2 Discussion

The public awareness program will begin concurrently with the initiation of the emergency planning and program development process. Emergency planning involves many elements of the community as planners solicit input from government, schools, health care institutions, fire departments, the business community, and others. The planning and program development process should have a very high profile. Involving the media in the planning process from the beginning can be invaluable in promoting education and public awareness of the emergency response program. The public awareness program will also be aimed at gaining public acceptance, as an emergency response program is only as good as the public perceives it to be. Upon completion of the initial planning process, there are a number of methods to maintain the established level of public awareness. Public information brochures are widely used to provide information to the community. Such brochures are generally mailed annually to all households within and near the emergency planning zone. In many cases this is the total extent of the public awareness program; however, it may not be completely effective. The brochures may be discarded as soon as they are received, or placed where they cannot be found immediately when needed. A novel approach to annual mailings is a wall calendar which contains the emergency information and is more likely to be retained. This public information material can prove to be an extremely effective complement to the public alert/notification system. The Emergency Broadcast System (EBS) is used most effectively when messages are restricted to relatively basic information. Specific information regarding relocation points, special facility plans, what to take to a mass care center, etc. will be included in printed public information materials and reference made to these materials in the EBS broadcast, thus freeing up air time for more critical messages.

Other effective public information materials can include posters and displays in transient areas, inserts into telephone directories, and emergency information provided by potentially affected special facilities such as schools and hospitals. An aggressive outreach program can be an effective public information tool. Presentations can be scheduled before civic and fraternal organizations. The media can be involved in actual training programs, drills and exercises. Specific programs can be scheduled to educate the media as well as the general public.

A good emergency public information program, which anticipates the concerns of the public and provides detailed information on necessary actions, is also an excellent way in which to diminish rumors and misinformation at the time of an emergency, subsequently reducing the burden on rumor control operations. Conversely, an effective rumor control program can serve to alert public information officials of prevalent rumors and identify areas in which public information releases would be useful. Local governments should maintain capabilities which allow for the provision of information to the public during emergencies. Such information will be available via regular telephone with the numbers advertised.

There are distinct advantages to creating a public information system for use by government and storage/disposal site spokespersons at the time of an emergency. The local government representatives will address only the activities that are being considered by local government in response to an emergency, not the specific details of the accident which caused the emergency. The specific information about the storage/disposal facility, chemical agent(s) involved, mitigative measures to resolve the emergency, etc., will be addressed by a site spokesperson at the same location.

#### 3.2.3.4.3 Alternatives

There are a variety of approaches to the provision of public information. Several are informal, or are realized as side benefits for a separate activity such as training for emergency workers or drills and

exercises. The provision of printed material regarding the response program has been required of the nuclear power industry for some time and appears to be effective.

The Emergency Broadcast System is in place to some extent throughout the United States. It may require expansion in certain areas. Public service announcements in the mass media, brochures and/or posters for transient areas, and telephone directory inserts are other options.

Public hearings or briefings on the preparedness program can be of value in that they will allow the public an opportunity to present specific questions and provide suggestions.

There are two basic approaches to configuring an emergency public information system. The first emphasizes the establishment of a joint media center for use by government spokespersons and the Army fixed site public affairs staff. The second emphasizes the development of a separate media center by each jurisdiction involved and by the fixed site.

The primary benefit to be derived from a comprehensive public information effort is the creation of a better informed population at risk, which is more likely to understand and implement appropriate actions for self-protection. An informed public is desirable; when the emergency public information system is an integral part of the public alert/notification system, it is essential that a reliable means of providing information in a timely fashion exists.

#### 3.2.3.4.4 Conclusions

A comprehensive public information and education process will be established at each site which includes the provision of annual hard copy materials to every household within the Protective Action Zone. In addition, an aggressive effort will be made to involve local news media in preparedness efforts, with particular emphasis on training and exercise programs. All

public information materials will be checked for reading level and will be multi-lingual, if appropriate.

A joint media center will be established for each site, and be located outside the area which could be affected by a chemical agent accident. Each media center will be large enough to accommodate all the media likely to attend and will have charts, maps and displays positioned for use on short notice.

A series of public meetings will be held at the end of the initial development phase of site-specific plans. These meetings will present basic information, address questions, and solicit input for plan improvements.

### 3.2.3.5 Evacuee Support

#### 3.2.3.5.1 Introduction

Evacuee support consists of those activities designed to receive and accommodate persons who have been evacuated from the area of an emergency. There are two primary components of an evacuee support system: reception and mass care. Reception is the process of establishing a capability to receive evacuees, determining their needs (i.e., medical, housing, family reunification), and assigning them to appropriate resources. Mass care is the activity of providing shelter, food, family reunification, limited medical care, and social services for evacuees. The primary agency for operating mass care centers is the American Red Cross, which is charged by statute with this responsibility. The coordination of mass care activities is a local government responsibility.

Historically, in most evacuations these activities are combined. That is, evacuees are directly provided with information on the location of mass care facilities and report to them if they are in need of any assistance. All activities are concentrated at the mass care center(s). While this approach has been reasonably effective in small scale evacuations, a more formalized approach in which evacuees are directed to report to a reception center located on a main evacuation route, their needs determined, and referred to appropriate resources allows for a more efficient allocation of resources, albeit at the cost of additional complexity.

#### 3.2.3.5.2 Discussion

The American Red Cross is a national organization with state and local chapters. Agreements for mass care operations are maintained with federal, state and some local governments. In the event of any emergency, regardless of the location or the size of the local chapter, support is available from other Red Cross chapters, branches or regions on a national basis. In addition, a number of regional and local social service organizations such

as the Salvation Army, churches, and governmental agencies play a similar role.

Local agencies may not be capable of supporting substantial mass care operations beyond one day. Most have mechanisms, formal or informal, to request and receive assistance from other government agencies. Historically, emergencies involving the release of chemical products have initiated population evacuations for a period of from one to three days. The number of people evacuated directly affects the ability of a local chapter to provide the level of support that may be needed. Previous experience regarding the percentage of evacuees that seek shelter in mass care facilities, gathered on evacuation reponses to a variety of natural and technological emergencies, indicates that between 3 and 20 percent of evacuees have in the past reported to shelters or relocation centers.[1] Therefore, to be conservative, planning will provide for at least 25 percent of evacuees at mass care centers.

Mass care center facilities must be evaluated before they are identified for use. The number of persons that can be accommodated in the facility is based on a specific square footage per person equation that is used by the American Red Cross and disaster officials to seek adequate facilities and space for evacuated persons. Once the assessment has been conducted, the American Red Cross and local disaster officials will know how many people can be housed in a particular area. The American Red Cross also requires that there be shower and toilet facilities and cooking/feeding facilities in proportion to spaces available in the mass care center. These requirements eliminate many buildings that may be considered for shelters. Typically, a mass care center will be located in a high school or junior high school building. Agreements with school, American Red Cross and local authorities must be initiated to ensure that areas of responsibility, liability and costs are addressed formally. The American Red Cross will normally take full responsibility for the operation of the mass care center, and the cost of its operation.

Mass care centers can provide family reunification services by use of commercial telephones and American Red Cross communications and can become a focal point for evacuee assistance provided by other disaster relief agencies. Medical care at mass care centers can only be considered at the first aid level, and not as medical triage centers. Injuries resulting from chemical exposure must be cared for at a local health care facility or other expedient facility established at the time of an incident. Decontamination services may be provided at mass care or reception centers. American Red Cross personnel, while trained in mass care center operation and management, may need assistance from local authorities to support the operation of the mass care center. This support can be in areas of police (security), fire/EMS (medical), logistics (transportation of supplies) and local school authorities (building usage).

### 3.2.3.5.3 Alternatives

The only alternative which is appropriate to this discussion regards the format of evacuee routing. That is, routing evacuees directly to mass care centers, or to reception centers and from there to mass care centers.

The primary benefit of direct routing of evacuees to mass care centers is simplicity. Institutional messages can be brief, public information materials can be minimal, and few staff (other than traffic control) are required outside of the mass care operation. The disadvantages to this approach are significant in large scale evacuations. There is the potential for excess evacuee flow to one facility; persons with special needs (i.e., medical treatment) must first go to a mass care center; there are no provisions for strip maps and detailed routing instructors except via pre-emergency materials and EBS. The philosophy of routing evacuees through reception centers has the benefit of allocating evacuees to mass care spaces and eliminating the problems of overcrowding or, more likely, underutilization. Many evacuations which route people directly to mass care result in the opening of a large number of mass care centers, each one filled only to 10-20% of its capacity. In addition, evacuees arriving at

reception centers who are in need of special care can be routed directly to such services.

3.2.3.5.4 Conclusions

A system of reception centers located along or near main evacuation routes will be designated for each fixed site. Reception centers will be designated for specific areas of the Protective Action Zone, so that individuals can be instructed in advance via public information programs. The primary purpose of the reception center will be to identify the needs of evacuees and refer them to appropriate services. These needs could include mass care, emergency medical care, secondary or tertiary medical care, family reunification services, and possibly decontamination. It may be expedient to collocate some of these services, particularly emergency medical and decontamination, with the reception centers. This decision is dependent upon the physical plant of the reception center, however, and must be made on a site-specific basis. The primary advantages of this system are twofold: evacuees all report to a standardized location if they need any assistance, which greatly simplifies public information efforts; and, the allocation of scarce resources is made more efficient by centralizing the decision process.

A number of planning considerations for the operation of mass care centers will be addressed as part of the site-specific planning effort. Mass care centers must be activated in a timely fashion and based on the condition and requirements of the disaster in order to be effective. This requires a coordinated planning effort between the local American Red Cross chapter, school district and emergency management officials. Mass care services provided by the American Red Cross are not a solution to long term relocation. Long term relocation may be necessary if the evacuated population could not be returned quickly to the area affected by the incident. The process of long term support is not a primary function of the American Red Cross and will be coordinated with other state and federal relief agencies as part of the long-term response to a serious accident.

Provisions for prompt decontamination of evacuees will be established at mass care or reception centers.

#### 3.2.3.5.5 Reference

1. "Guidance on Registering and Monitoring Evacuees of Radiological Emergencies", Federal Emergency Management Agency, 1985.

### 3.2.4 Emergency Response Program Development and Implementation

There are a number of activities which are necessary in order to develop and maintain a functional emergency response program. Emergency response plans, which establish the policies and concepts which will guide the response, are in essence a written description of the program which is in place. Implementing procedures provide the detailed response activities and actions which are required to actually carry out the plan. Training of emergency workers and response officials as to their roles, responsibilities and specific skills is essential. Drills and exercises are valuable in that they test the plans and identify potential problem areas while at the same time they provide valuable training and practice for emergency personnel. The development and implementation of the preparedness program must be carefully thought out, conducted to specific standards, and coordinated among all involved parties.

#### 3.2.4.1 Plan and Procedure Development

##### 3.2.4.1.1 Introduction

Emergency plans generally describe a jurisdiction's emergency management system, including the emergency management structure, assignment of responsibilities, establishment of resource inventories, description of equipment and facilities to be used, the manner by which the public is notified, and how the emergency response system will work. In essence, the emergency plan is a description of the jurisdiction's preparedness program -- how it is established, how it works. In order to actually carry out the actions described in the plan, detailed implementing procedures must be developed for each functional area of the plan and for each participating organization.

##### 3.2.4.1.2 Discussion

Emergency plans provide the framework on which an emergency response program in constructed. The plans will contain a description of the philosophy of

the program, its concept of operations, legal authorities, assignment of responsibilities, resource needs and sources, and a basic description of how the response will be conducted. Each affected jurisdiction must have a plan specific to chemical agent accidents, whether a separate document or a hazard-specific annex to a disaster operations plan.

Implementing procedures are detailed, step-by-step checklists for the completion of specific activities or functions. Examples of functional areas which require detailed procedures include: accident notification, Emergency Operations Center (EOC) activation, communications, EOC security, message handling, decision-making, and public alert/notification. In addition to these functional areas, each participating organization must have detailed procedures for its response. Some of the organizations needing procedures are: law enforcement, fire services, health/medical services, industry, public information, transportation, and schools.

The most effective emergency response programs employ a mixture of functional area and organizational procedures, rather than all of one or the other. The primary emergency management agency (Civil Defense, Office of Public Safety, Office of Emergency Management, etc.), will be guided by the functional area implementing procedures. The notification procedures, wording and composition of the notification message, verifying the authenticity (if necessary), and the degree of response, based upon the severity of the incident, will be previously established. Formal emergency classification levels will dictate the mode of action by the person receiving the message. These procedures allow, for example, a police department dispatcher to initiate the activation of the emergency response system, as the notification will contain a classification which will automatically trigger a certain level of response. No complicated, time-consuming decision-making process would be required at this point because of the detailed procedures available to that person. Once the notifications are provided to the Emergency Operations Center (EOC) response group, the center is activated in accordance with established procedures. When the decision-makers in the system are alerted, the information that is necessary

for protective response decisions will be automatically transmitted as part of the notification message from the fixed site.

Emergency response programs are generally characterized as being managed by a single individual, either the chief elected official or his designee, usually the emergency preparedness director or coordinator. An effective, comprehensive emergency response system is much too complicated for one individual to personally direct all the activities that are required. In the event of an evacuation, for instance, the following activities should be considered prior to issuing a general evacuation order: schools, day care centers, hospitals, nursing homes, and other special facilities should be notified; special populations must be notified (hearing impaired, mobility impaired, etc.) and transportation arrangements made; public information must be available for release upon activation of alert/notification systems; emergency reception and mass care facilities for the general public, special populations and institutions must be activated and made ready; transportation resources must be activated, traffic and access control points must be manned and information and rumor control facilities must be established; health/medical services must be assigned; and railroads, airports, Coast Guard stations, and other such services must be notified.

Many activities have to be initiated or accomplished to support an effective response, and all these activities cannot be managed by one person. Written procedures for each organization involved in the response ensure smooth operations during the emergency. Once an initial response decision is made, individual EOC staff members need to have a precise listing of all the activities within their area of responsibility which have to be accomplished. A great deal of coordination is necessary to implement the actions required during an emergency response; however, the most critical areas of coordination can be anticipated and included in the established procedures.

By establishing an emergency classification system which will be used in the accident notification process, benchmarks or levels of severity can be established which allow responders to initiate a predetermined level of response without the necessity for major decisions to be made throughout the

development of the emergency situation. For example, if upon arrival at the EOC, the accident classification is a "Level 2," each staff member will have a specified list of activities that should be carried out at this point. If the accident should escalate to a "Level 3," many of the necessary response activities will already have been initiated or accomplished at the preceding emergency classification.

The purpose of implementing procedures is to program or systematize the emergency response to the highest possible degree. The fewer the occasions for subjective decisions, the quicker the response.

#### 3.2.4.1.3 Alternatives

There are a variety of methods and approaches to formatting emergency response plans. One plan can be developed which covers the entire off-site response, involving multiple jurisdictions. Each jurisdiction can develop its own independent plan, or a hazard-specific annex to an overall emergency operations plan.

The benefit of having a well developed emergency response plan, coupled with detailed implementing procedures, derives from the provision of a much more organized effort in mounting a response. Resources will be allocated and deployed more efficiently, duplication of effort will be minimized or eliminated, and gaps in the response will be identified and addressed in advance.

#### 3.2.4.1.4 Conclusions

Every affected local jurisdiction and state will have a chemical agent-specific response plan or specific annex to an operations plan. Every emergency plan developed in support of the Chemical Stockpile Disposal Program, including the on-site (CAIRA) plans, will be accompanied by detailed emergency plan implementing procedures. These procedures will include both functional procedures, addressing the various functions of the program, and agency-specific procedures for all agencies and organizations

participating in the response. Implementing procedures will be in an easily-read and understood format, preferably in the form of a sequential "checklist". All procedures will be geared to the emergency classification level system developed as part of the plan. Implementing procedures will be developed in conjunction with the staff officer or organization tasked with carrying them out. Following each drill or exercise, procedures will be revised as necessary to address deficiencies and improve performance.

#### 3.2.4.2 Training

##### 3.2.4.2.1 Introduction

Training of emergency response personnel is an essential activity that follows an emergency planning effort and precedes drills and exercises in a total program of emergency preparedness. The training must be carefully tailored to the emergency plan, provided to all of the appropriate personnel, thoroughly documented, and include participation by the storage/disposal site and off-site agencies. All emergency response personnel will receive some level of training pertinent to their emergency response role as defined either by the emergency plan or by the specific agency procedures. Personnel to be trained include hospital staffs, emergency medical personnel, fire personnel, law enforcement personnel, local disaster officials, and others who would become involved in response to a chemical agent accident. The training program for off-site personnel will be geared to the specific group that is being trained. The training program will include a general presentation of the issues and specific training on operating procedures, responsibilities and assignments for each organization involved. Information related to EOC operations, protective action implementation, exposure control, medical intervention and decontamination, and agent exposure symptoms, self-decontamination, first aid, and contamination control will be covered in a total training program.

##### 3.2.4.2.2 Discussion

Training programs will be developed through the coordinated efforts of local disaster officials and military authorities. However, training program implementation will be coordinated through a single agency in order to assure proper participation, continuity and coverage. The local disaster agency may be the most appropriate agency to accomplish this task. Whether identified as emergency management or civil defense, the local agency may not be capable of training program design and development, but can be instrumental in the program's implementation. Often, local disaster officials are designated by state emergency management legislation and/or

policy to provide training programs for emergency response personnel. These local disaster agencies would be directly involved in a chemical accident, coordinating the local emergency organization's response to the emergency. While program development issues such as definition of audience, objectives, design, funding, location, type, etc., may be coordinated and decided by several organizations, program administration at the local level must be conducted by the local emergency management organization.

#### 3.2.4.2.3 Alternatives

While there are a variety of alternatives regarding the organization and presentation of training programs, there are really no acceptable alternatives to the provision of training for essential workers.

There are a number of benefits to be derived from the provision of training. Any response plan is only as effective as the personnel who carry it out; if these individuals have not been trained as to their duties, given the necessary skills, and taught to protect themselves the response program will likely fail in its early stages.

#### 3.2.4.2.4 Conclusions

All individuals with an emergency response assignment will receive training. Training will provide basic information on the local preparedness program and task-specific information on assigned responsibilities. Additional information on chemical agent self-protection will be provided to all emergency workers, and where possible, training will include practical exercises. Refresher training will be offered annually. The local training program will be overseen and administered by the local emergency management agency. If program development and curriculum development capabilities do not exist at the local level, such assistance will be provided. Standards will be established to ensure appropriate and adequate course content. A training needs analysis will be prepared to lead to the development of course modules supported by detailed audience-specific lesson plans (i.e., medical, fire, EOC staff). Lesson plans will incorporate adult learning

principles and audio visual materials and training aids will be designed to capture and hold the interest of adult audiences. Detailed records regarding the training of individuals and organizations will be maintained.

### 3.2.4.3 Drills and Exercises

#### 3.2.4.3.1 Introduction

An integral, yet often misunderstood element of an effective emergency management program is the drill/exercise phase. A clearly defined and developed exercise program is an effective tool for determining the validity of the written plan and procedures and for allowing participants to practice the skills learned in formal training programs. The exercise program, conducted in several phases, allows for the rehearsal of response functions and roles and provides planners and response personnel with a detailed critique of the planning and response elements of an emergency response system. Events such as the December, 1982 Taft, Louisiana chemical plant explosion and subsequent evacuation of nearly 30,000 residents illustrate the importance of developing and conducting a comprehensive exercise program. Emergency personnel who were involved in the response to the accident had all participated in a series of drills and exercises in conjunction with an emergency program for a nuclear power plant in Taft. The consensus of those who responded to the Taft incident was that, due in large part to the training and exercise program, an orderly and efficient evacuation was accomplished effectively under very difficult circumstances.[1] A similar experience occurred in March, 1987, when the town of Nanticoke, Pennsylvania and adjacent areas were evacuated due to a hazardous materials fire. Nanticoke is within the EPZ of a nuclear power plant and emergency responders placed much of the credit for the very successful response on the recent series of drills in which they had participated in preparation for the biennial power plant graded exercise.[2] The exercise program will be an ongoing effort which ensures response capabilities are maintained.

#### 3.2.4.3.2 Discussion

An effective program will contain drills designed to test specific elements of the emergency management program as well as exercises that range from minimal coordination exercises to major full field exercises. The exercise

program must include provisions for remedial exercises as well as periodic major demonstration exercises to ensure that the overall response system is effective. An integrated exercise program will be developed, involving both on- and off-site emergency response personnel. Each element of the emergency plan and associated procedures (i.e., communications, traffic control, etc.) must be tested to ensure that each is workable and that it is properly integrated into the overall planning effort.

3.2.4.3.3 Alternatives

The primary alternatives for this category consist of drills and exercises. A drill is a supervised activity that tests, develops and maintains skills that are specific to a single response activity. A number of individual elements such as warning/notification, communications and decontamination can be addressed in the drill portion of the program. The advantage of a drill is that it addresses a single component of the response activity at a minimum of cost and utilizes only those personnel and necessary equipment identified in the plan or procedures for that function. The frequency of each type of drill can be determined by such factors as personnel turnover, plan and procedure changes and the criticality of the function being drilled. While drills can be conducted for several elements simultaneously (i.e., a communication drill and an alert/notification drill), they should be relatively limited in scope.

Generally speaking, an exercise is a supervised activity that tests the skills and activities of the emergency response agencies and tests all or many of the elements of the emergency plan, depending on the type of exercise. The most common types of emergency exercises are tabletop, emergency operation simulation (EOS) and field exercises. Tabletop and emergency operation simulation (EOS) exercises are conducted with simulated activities and are conducted in a structured and controlled environment. A full field exercise involves the actual performance of certain emergency response activities with close-to-real conditions.

A tabletop exercise is an exercise that can be conducted in a class or meeting room environment and can usually be conducted by a single controller (instructor). This type of exercise is primarily used as an instructional type of exercise designed to familiarize or train participants in the use of established plans and procedures. A tabletop exercise can also enlighten agencies to the activities of other agencies and prompt interaction without the pressures of a more realistic environment, and can lead to discussion of planning strategies and design of future training programs. The tabletop exercise can be used for decision-makers in the EOC and is a cost efficient method to test agency interaction at the administration level.

An Emergency Operation Simulation (EOS) is an exercise that tests the full scale operational capabilities of the Emergency Operation Center (EOC) without involving any field activity. This type of exercise includes basic scenario information supplied by a controller but also includes activities such as message control, emergency notification and decision making. An EOS can be designed to test the decision-making capability of key personnel while adding real-time activities (drills), such as notification or communications activities. An EOS exercise can be conducted with a restrictive time schedule that would dictate emergency response activities and add "pressure" to the decision-makers without any response outside of the EOC, other than receiving phone messages and activating communication nets. An EOS is also a cost efficient exercise in that only the key personnel of response agencies participate and that little outside support is needed. Conduct of an EOS requires at least one "lead controller", who provides the input data necessary to stimulate exercise play and provides scenario information at various levels in the response network. Other controllers can assist in exercise play and ensure that agency activites are kept within the EOC and that response is according to the plan and procedures.

A Full Field Exercise (FFE) is an exercise that tests the entire emergency response effort, and involves actual mobilization of emergency response organizations. An FFE would include the activation of emergency facilities such as the EOC and mass care centers, hospitals, command posts and may

include activation of fire, EMS, or emergency worker personnel. An FFE will test the entire command and control network of the emergency organization and will involve interface between EOC agencies, field agencies, the public and the media. This type of exercise is the single most effective means of testing the entire emergency response organization and most of its components in a realistic fashion. An FFE in support of the chemical stockpile disposal program must involve the storage/disposal site and all potentially affected local government jurisdictions in a real-time scenario.

The primary benefits to be derived from a drill and exercise program are twofold: testing of plans and procedures in a realistic environment in order to identify and resolve potential deficiencies; and "hands-on" practice and training for emergency response personnel. Any response program, no matter how well thought out, is dependent upon its personnel. The availability of trained, proficient personnel is essential.

#### 3.2.4.3.4 Conclusions

A comprehensive drill and exercise program will be developed for all response organizations at each fixed site, including off-site jurisdictions and organizations. Specific functional drills will be conducted on an as-needed basis for all skill areas, particularly technical areas such as accident assessment, monitoring, decontamination, and communications. Tabletop and EOS exercises will be an integral part of the preparedness program's training effort, and also be considered as "refresher" programs for the time between full field exercises. A full field exercise will be conducted annually. This exercise will involve full participation from the fixed site, all potentially affected local governments, and as many field organizations as possible. All drills and exercises will have specific objectives. Each drill and/or exercise will be evaluated using these objectives. In areas where a need for improvement is identified, remedial drills and exercises will be conducted.

### 3.2.4.3.5 References

1. "Detailed Report on the Evacuation of December 11, 1982". Envirosphere Company, NY, NY.

2. "Report on the Evacuation of Nanticoke, Pennsylvania, March 24, 1987." Schneider/EC Planning and Management Services, Harrisburg, PA.

### 3.2.4.4 Program Implementation

#### 3.2.4.4.1 Introduction

This section identifies and discusses issues which must be addressed in the implementation of an expanded emergency preparedness program for the chemical stockpile disposal project. Regardless of the ultimate decision on which method, or combination of methods, is used to demilitarize the chemical stockpile, efforts must be extended in improving emergency preparedness at the eight continental U.S. storage sites. These sites will continue to stockpile chemical weapons through the end of the disposal process, a period of seven or more years. If on-site demilitarization is selected, the disposal process will occur at these same sites. Thus, it is prudent to implement additional emergency preparedness efforts at these sites without delay.

#### 3.2.4.4.2 Discussion

This concept plan discusses the components of a comprehensive emergency preparedness program, identifies a concept for the preparedness program in support of the chemical stockpile disposal program, and specifies actions to be taken. Once a decision is made as to the appropriate level of preparedness and specific actions needed to achieve that level of preparedness, a detailed set of programmatic emergency preparedness standards will be established. Such standards will guide the development and implementation of site-specific preparedness programs, ensuring that essential criteria are addressed regardless of the format and configuration of site-specific plans.

The actual program development and implementation process will follow several steps. Following the promulgation of a set of programmatic planning standards, the development and/or enhancement of site specific preparedness programs will begin. This activity involves a number of actions, including the configuration of the response management and command and control structure, format of the plan document, coordination with existing plans and procedures, and definition of a specific concept of operations. When the

plans are completed in draft form, they will be evaluated for consistency with program standards and modified as appropriate. When plans are substantially complete, specific implementing procedures will be developed. Training must be conducted for response personnel, drills and exercises conducted, and necessary revisions made. Upon the completion of these development activities, a program maintenance effort will be initiated in order to keep plans and procedures up to date, maintain personnel proficiency, and periodically test preparedness levels.

3.2.4.4.3 Alternatives

Most, if not all, of the off-site jurisdictions at the eight fixed sites do not have the resources at present to implement a response program such as described in this plan. The primary discussion of alternatives for this component thus emphasizes various approaches to support for the program development and implementation process.

It is appropriate that the federal government support the program development and implementation process, either through the Army, the Federal Emergency Management Agency, or some other mechanism. Alternative approaches to the provision of such support include the provision of technical assistance via contractors, the provision of direct financial assistance to state and local jurisdictions, as appropriate, for staff and other expenses, or the provision of FEMA technical assistance to state and local jurisdictions.

There are advantages and disadvantages to each alternative. Army provision of direct assistance to jurisdictions via contractors allows for the most direct oversight and management of the process by the Army, but may not be the preferred alternative by the states and localities. Funding of staff positions in local and state response agencies would diminish the Army's control of the effort but would probably be the preferred alternative to local, and possibly state, governments. The provision of FEMA assistance would ensure that expert staff would be available, but would require

considerable coordination between the Army and FEMA and would likely tax FEMA's staffing capability.

3.2.4.4.4 Conclusions

Detailed program standards will be developed to guide the implementation of site specific preparedness programs. The initial development of these standards will be conducted by the Army with contractor assistance. Review and revision will be assigned to an interagency federal task force, coordinated by FEMA. The Army will also be actively involved in this effort. These standards will be published in draft form and provided to affected state and local governments and other federal agencies for review and comment. Following this phase, a final version will be promulgated. Once the standards have been established and revised following review and comment, a coordinated process will be developed to establish or enhance preparedness capabilities at the eight sites. In the interest of time, this will be done simultaneously at all sites. Necessary activities include:

- Briefings/Introduction of Process for State and Local Officials
- Plan Revision/Development (On-site and Off-site)
- Training of Emergency Responders
- Drills and Exercises
- Program Maintenance

The federal government will support this effort. The approach to planning and implementation efforts at the state and local level will involve the provision of direct funding for the retention of professional emergency preparedness staff by the state and local jurisdictions. The Army will maintain a technical oversight role, via contractors, to ensure that program standards and time schedules are met in each state and local jurisdiction and to provide technical assistance and guidance to local and state program development staff.

## 3.3 ALTERNATIVES - EMERGENCY RESPONSE CONCEPTS FOR TRANSPORTATION

This section of the concept plan discusses additional concerns regarding preparedness concepts for those disposal options which involve the transportation of chemical agents. This discussion addresses those components of an emergency preparedness program which differ significantly from a fixed site response as discussed in Section 3.2. It is important to note that this section addresses only additional areas of concern for the transportation options; all of the fixed site aspects discussed in Section 3.2 are applicable to the transportation options as well in that the points of origin and destination are, and continue to be, fixed sites through the duration of the disposal process.

The overall concept of transportation adds several new considerations to commonly used emergency planning techniques. The first consideration is a major increase in the area under study. In fixed site planning, a relatively small planning zone is identified, with characteristics that are easily identified and any change is gradual within that zone. In transport, the area of focus expands to cover the entire movement area from storage to final destination. This area contains an extremely large potential for differing environments, and due to its size, major changes can be more frequent. A second consideration includes the mode of transport selected (i.e. rail-air-water), which presents special concerns relative to each mode of transportation. These special concerns include the volume of agent carried (magnitude of release), size of area of impact, type of release (air vs. water) and nature of affected area (community size, demographics, geographics, etc.) At a fixed site, a single emergency response organization can be developed to comply with the needs of one location. In transport, the degree of development of emergency response programs will vary greatly along the transport routes chosen.

In essence, the occurrence of an accident during the in-transit phase creates a fixed site accident, with all of the same requirements and responses discussed in Section 3.2. However, detailed response planning must be based on a different philosophy since the potential accident sites

cannot be anticipated, and can occur at any point on the transportation corridor.

Full scale planning for the areas adjacent to all transportation routes is possible, but is not practical within the chemical stockpile disposal program time frame. Assuming that all transportation routes are identified several years in advance, the establishment of emergency response programs for the entire corridor could be initiated. This effort would involve thousands of organizations, agencies and individuals. The planning organizations would require extensive resources and most local communities would undoubtedly require assistance to meet basic emergency planning requirements. The substantial cost and time commitments are only part of the problem. Due to the size of the stockpile and the rail cycle time, the total transport time must be measured in years. This indicates that once developed, an ongoing effort to maintain effectiveness would also be required.

Precautionary evacuation along the transportation route could be accomplished with each shipment. During this evacuation, however, hospitals, nursing homes, schools and homebound individuals would need to be evacuated regularly for a period of years. This would require a planning effort equal to that described above with the additional impact of increased risk from evacuation as well as the disruption of normal day to day operations and economic activities for major sections of the populace.

To reduce the overall impact and cost of planning, a model of regional emergency response planning could be initiated. In this option a series of regional emergency response organizations could be established, so that the planning effort would be limited to regional response areas. Since response time is an important factor in reducing adverse impacts or casualties, the distance from one group to the next must allow reasonable response to all areas between them. The overall level of effort could be reduced if a lengthened response time would be acceptable. This approach would also require more complex methods of communication and control. Given the

increased response time, it is unlikely that such a program could mitigate the immediate and short-term effects of an accidental agent release.

Another approach to developing a response capability for the transportation options involves the development of a "portable" emergency response effort, which would be incorporated into a mobile escort capability. This approach appears to have considerable merit for a number of the more technical or "hardware" areas discussed in Section 3.2, such as Accident Assessment and Communications. However, other aspects of a preparedness program, such as Special Populations, Transportation, and Mass Care do not lend themselves to such an approach. Consequently, it must be recognized that emergency response programs for the in-transit phases of the transportation disposal options inherently provide a lesser degree of mitigation then do fixed-site response programs. It is highly unlikely that any approach, or combination of approaches, to emergency response for the in-transit phases of the transportation disposal options can provide a level of mitigation which is equivalent to the level of mitigation possible for a fixed-site response program.

### 3.3.1 National and Regional Disposal Options - Rail Transportation

This discussion is applicable to both the national and regional disposal options, in that both options entail the transportation of chemical agents via rail.

#### 3.3.1.1 Introduction

The transportation of chemical munitions by railroad to a national destruction site at Tooele Army Depot, Utah or regional sites at Tooele Army Depot and Anniston Army Depot, Alabama, would be accomplished by loading sealed munitions containers on a unit train dedicated to munitions carriage. Munition containers will be carried on a type of railcar currently used in rail commerce built specifically for carrying two stacked shipping containers of standardized dimensions. Munition trains may carry several types of munitions and/or bulk containers, but they will contain only one type of chemical agent.

Shipments of munitions will consist of a munition train preceded by an escort train. The munition train will carry the munition containers, support equipment, the convoy commander, security forces as required by Army Regulation 50-6 and Army Regulation 50-6-1 and other support personnel. The escort train will carry medical supplies and personnel, additional security forces, and other support personnel. Munition trains will not exceed 8,000 feet in length so that they can fit on most sidings. Under normal conditions, the munition containers will require no handling or opening en route. However, safe stopping locations will be identified along the route for handling containers if required in an emergency.

The number of trainloads required to transport the stockpile of chemical munitions will depend on train length, the type of rail car used to carry munitions, and whether containers are double stacked. Using trains of 8,000 feet and double-stacked containers will result in the fewest trainloads. For these conditions, about 70 to 75 trainloads will be

required for the national destruction center alternative. For the regional destruction center alternative, about 50 to 55 trainloads will be required.

Details of train movements and order of shipping will be worked out if rail transportation is to be implemented.

### 3.3.1.2 Emergency Response Management

There are a number of areas in this category in which the response to a rail transportation accident would differ significantly from the response to a fixed site accident.

Because an accident could occur at any point along the rail corridor, there is no fixed point of reference around which to develop a response capability. The rail corridors for both national and regional disposal options involve an extremely large number of state and local jurisdictions, with a wide variety of governmental configurations and authorities. Command and control of emergency responses and protective action decision-making would require interfaces with a vast number of jurisdictions and agencies. No fixed accident assessment system will exist at the accident site, although the munitions train will be equipped with an extensive monitoring and hazard prediction capability. Due to these issues, there are three primary options for configuring an emergency response management structure for the rail transportation options. These are full-corridor planning, state or regional-level planning, and development of an expanded escort emergency response capability.

The development of a full scale emergency response capability for the rail corridor(s) is possible, however, the number of local jurisdictions, is so extensive that it is not likely that a program could be established which could be effectively implemented and maintained within the schedule of the stockpile disposal program. State or regional planning presents a more limited number of jurisdictions, although still quite extensive. However, it is doubtful whether such an approach can result in an effective immediate response. Inclusion of emergency response capabilities into the already-planned escort train appears to have considerable merit for technical activities such as Accident Assessment and Communications. However, community-based response activities such as Evacuee Support and Special Populations do not lend themselves to adaptation to an escort capability. Consequently, the development of an emergency response capability for rail transportation will involve a hybrid approach

emphasizing the development of an escort-based capability for all appropriate program components, and state or regional corridor planning for the remaining components and areas of interface.

A discussion of specific actions for component areas within this category follows.

#### 3.3.1.2.1 Coordination of Emergency Response

The significant consideration for this component in comparison to fixed site planning is the potential that a given set of elected officials and/or local emergency management personnel may not possess adequate knowledge to carry out the management of an emergency response for a chemical agent accident, or that there is no clear delineation of management responsibilities due to an inability to contact one or more local authorities.

In order to ensure that a coordinated response structure exists, the escort group will contain a team of qualified emergency response managers. By maintaining 24 hour contact points for elected officials/disaster preparedness staff for all communities within the corridor, the escort manager (CAIRA Officer) will provide the necessary expertise in response management, and will also serve as the main interface (via direct contact or radio link) between escort personnel and community emergency response personnel. Such individuals will possess a firm understanding of emergency response management resources available in the escort group and on call. Allowing state agency officials, state police and local police to track shipments will enhance the coordinated response by these groups.

#### 3.3.1.2.2 Command and Control

In a transportation accident response, there will be no previously defined relationship between the community officials along the transport route and the escort command and control team. Additionally, the local communities

may not possess a functional emergency response organization or Emergency Operations Center.

The escort group will therefore include sufficient personnel and resources to support the command and control functions of community officials, through the escort emergency response manager (CAIRA Officer). Although local community officials will bear the responsibility for command and control actions involving their area of jurisdiction, guidance, equipment and supplemental staff from the Army will be required to enhance this element and allow for civilian decision-making. The escort emergency response manager (CAIRA Officer) will designate technical escort liaison staff to report to affected local emergency operations centers or seats of government.

3.3.1.2.3 Communications

In a response to a transportation accident, escort personnel (community liaisons, security personnel, route alert teams, field monitoring teams, etc.) will be required to leave the escort train and travel throughout the affected communities. There will be tactical radio communications established between local communities, the escort train and emergency response field personnel. Communications will also be established between the escort train and Army command and technical groups; current transportation planning calls for secure military or satellite communications for this function.

In order to ensure field communications during an accident, all portable radios will be able to operate effectively within the entire potential emergency response zone. Consideration will be given to placing vehicular repeaters on the munitions train, escort train and response vehicles. In addition, consideration will be given to cellular phones and satellite links on the escort train, to ensure local, state and federal notification, and reliable backup communications with Army command and support structures. A comprehensive contact list for local and state officials and emergency responders, containing radio frequencies and telephone numbers, will be

maintained for all potentially affected jurisdictions. Communications equipment on the escort and munitions trains will be capable of reliable operation on all commonly used public safety and local government radio frequencies.

3.3.1.2.4 Accident Assessment

The primary difference for this element is that currently all accident assessment capabilities are fixed at the existing storage sites. Unlike fixed sites, prevailing winds and historical meteorological data will not be available for all points within a transportation corridor. The availability of reliable metoerological data will vary extensively for different points within a corridor.

Consequently, the escort group will contain a team of accident assessment personnel. They will be equipped with meteorological instrumentation, a portable computerized plume plotting capability, monitoring equipment, local maps (showing rail mileage markers) and protective gear and will have access to national weather data. Field monitoring and environmental sampling teams will be carried to allow for verification of downwind hazard projections. In the event of an accident, an immediate assessment will be conducted at the accident site and results transmitted to the escort emergency response manager who will relay this data to community officials and emergency response staff. A backup accident assessment capability will be maintained at a fixed site accessible via radio from the escort train.

3.3.1.2.5 Protective Action Decision-Making

The main difference for this response component for a transportation accident is that at fixed sites, the relationship between the site and local community decision makers has been formalized and procedures list pre-determined localized responses to given situations. In the transport mode, no such relationships will have been previously established and all decisions to implement protective actions will require that data from the technical escort accident assessment personnel be relayed and explained to

community officials. Response zones and protective actions will be designated and determined on an ad hoc basis.

The escort emergency response manager (CAIRA Officer) will obtain accident assessment results from the technical escort accident assessment team and provide them to local community officials and emergency response personnel. In addition, he will provide advice and assistance to local officials in choosing the most appropriate protective actions and in designating protective response zones.

### 3.3.1.3 Protective Actions and Responses

The variety of protective action options is considerably smaller for response to transportation accidents, with a lower degree of effectiveness. The size of the corridor and population concentrations within it will tend to render those protective action options which involve the distribution of equipment, or modification of structures, impractical. This narrows the range of options to evacuation, sheltering (with possible expedient actions to decrease infiltration), or combinations of the two.

Given the size of the rail corridor(s) and the area which could be affected by an accident, it is also considered to be impractical to install a fixed public alert/notification system specifically for this Chemical Stockpile Disposal Program. Therefore, unless an existing public alert system is in place in an affected community, this emergency response component will depend upon route alerting measures conducted by escort personnel, supplemented by local emergency responders if available, in conjunction with the Emergency Broadcast System. It should be noted that this approach to public alert/notification will not be as effective as a fixed system; it is the only alternative which is at all viable. Advance dissemination of public information has been addressed in the transportation concept plan. Such information will also incorporate emergency response information for the public.

In the absence of local site planning, sufficient manpower may not be available on short notice to conduct traffic control and limit access to the accident area. Traffic routing and the identification of potential congestion points will not have been completed. The capability to control traffic and limit access to affected areas by local communities will vary markedly among areas along the rail corridor.

Current transportation concept plans call for the provision of protective equipment for escort response personnel. Such protective gear will be stockpiled on the escort train for all technical escort emergency response personnel and for provision to local emergency responders.

The escort emergency response effort will be prepared to recommend evacuation or sheltering to local officials as the only viable protective actions. This applies to special population groups and institutional populations as well, who cannot be considered separately from the general public in this situation. The escort group will have a capability to route alert affected areas, and access the EBS system and other media in order to broadcast emergency warnings. The escort group will have a capability to control access to the affected area, and have full protective clothing for all escort group personnel.

A discussion of specific actions for component areas within this category follows.

#### 3.3.1.3.1 Protective Action Options

In general, evacuation and sheltering are concepts which will be familiar to many local emergency management officials and will require relatively little explanation from the escort emergency response manager. It must be noted that these options will not provide a significant degree of protection to those persons located near the accident scene. They are, however, the only responses available. Emergency public information materials which provide guidance on expedient methods to reduce infiltration will be provided to households along the rail corridor. Such information will also be included in sample EBS messages carried by the technical escort response team.

#### 3.3.1.3.2 Public Alert and Notification

With the assistance of the escort emergency response manager (CAIRA Officer), local community officials will prepare and release EBS broadcast announcements with appropriate protective actions. Immediate area notification will be conducted by technical escort security personnel via route alerting as they establish and maintain an exclusion area. Local law enforcement and emergency response personnel, where available, will provide direct notification in an expanding circle with emphasis on downwind hazard areas using Public Address (PA) systems and/or door to door notification. While such a system is considerably less effective than an established

system based on sirens or tone alert radios, it is the only system which is feasible given the constraints imposed by the rail transportation options.

3.3.1.3.3 Traffic and Access Control

The escort group will carry additional security personnel, with transportation and equipment, who are available for assignment to access control and traffic control tasks if needed. Local law enforcement resources, as available, will be assigned first to traffic control responsibilities due to community familiarity. Army personnel will establish an access control security perimeter. Careful coordination with local law enforcement officials is essential. In addition, the legal authorities of Army security personnel operating in civilian areas will be explored as part of the planning process.

3.3.1.3.4 Special Populations

The only protective action options which are available to the general public (evacuation and sheltering) are also the only options available to special population groups and residents of special facilities. The escort emergency response capability cannot feasibly provide a special facility response capability. Therefore, the effectiveness of the immediate response involving special populations is dependent entirely on the existing emergency response program in place at the accident site. This aspect of a transportation response program provides a considerably lower probability of mitigation than for a fixed site response.

3.3.1.3.5 Emergency Worker Protection

All technical escort response team members will have full protective equipment. The escort unit will also stockpile additional units of protective equipment for civilian responders, to be distributed at the time of an accident. It is not possible to estimate the number of civilian emergency workers who may be available at any accident site; therefore, 100 sets of protective equipment for civilian emergency workers will be stockpiled.

### 3.3.1.4 Emergency Resource and Information Management

It is logistically infeasible to include more than a minimal emergency medical services (EMS) capability within the escort response team. Current transportation plans call for the inclusion of a medical capability composed of 2, 13 person teams working 12 hour shifts. This capability is sufficient for treatment of casualties on the munitions train and in the immediate area but will not be sufficient for community medical support in the event of a major release. Medical supplies (agent antidotes, etc.) and equipment will be transported in sufficient quantity to support a mass casualty accident; these supplies will be transported to the off-site area by escort staff. The off-site emergency medical response, with these exceptions, will depend upon the existing local EMS system in the initial response phase. State, federal and military support will be mobilized for the secondary and tertiary responses.

It is infeasible to establish an escort-based capability for the transportation of off-site individuals in need of evacuation transportation. The capability of the off-site transportation response is directly dependent upon existing response plans and resources. The availability of community resources (personnel, vehicles, mass care centers, etc.) to support a response will vary along the rail corridor, as will the capabilities of existing local emergency response programs. Emergency public information in the initial phase can only be provided by EBS and route alerting unless the impacted area has a siren or other system in place. In addition, the escort response team will be prepared to directly access the EBS system and other media, and will have prepared, pre-formatted messages and protective action instructions.

It is neither feasible nor practical to incorporate an evacuee support (reception and mass care) capability into the escort response team. Such activities, however, are common to many types of emergencies and local jurisdictions along the rail corridor should, in most cases, be capable of implementing such a response.

A discussion of specific actions for component areas within this category follows.

3.3.1.4.1 Emergency Medical Services

State or regional planning activities will emphasize the development of EMS mass casualty plans for all areas of the rail corridor. Plans for deployment of additional federal or military personnel will be established as discussed for fixed sites.

3.3.1.4.2 Resources

Previous sections have discussed the types of resources which could be carried on an escort or munitions train and which could be of value in a transportation accident. These resources consist of personnel for community liaison, accident assessment, command and decision-making, monitoring and decontamination, public alerting, communications, and traffic and access control. A variety of equipment is required in order to support these personnel; detailed personnel and equipment needs will be developed as a part of the site-specific planning process.

3.3.1.4.3 Public Information

A public information program which is not site-specific will be designed for inclusion in the escort emergency response program. This effort will include pre-formatted information releases, EBS announcements and protective action instructions which will be provided to affected governments through liaison staff at the time of an accident. A Public Affairs Officer with authority to speak for the Army's response effort will accompany the escort train staff. Additional Public Affairs staff will be available for deployment to affected local and state governments as liaisons. In addition, a directed public awareness program in the form of periodic press releases to media along the corridor will be considered. EBS station assignments along the rail transportation corridor will be identified and

modes of access designated. Direct Army access to local EBS stations, from the escort or munitions train, will be established.

### 3.3.1.5 Program Development and Implementation

Plans and detailed procedures will be developed for the technical escort response team, the command structure for the transportation program, and for affected states. Sub-state (regional) planning may be necessary in states with large land areas or extremely heterogeneous population concentrations and demographics.

Training will be provided for all escort team personnel in specific emergency response actions in addition to the training planned for in the rail transportation concept plan. Training will also be provided to state response team personnel in all corridor states, and for any Army response personnel who would be mobilized and deployed to the accident area. Drills and exercises will be developed specifically to evaluate and test transportation emergency response plans. Since the escort program must interface with local elected officials and civilian emergency management personnel, drills and exercises will place special emphasis upon the escort's availability to interface with a wide variety of community types, emergency preparedness programs, and accident scenarios. This wide variety of variables can most efficiently be posed in an Emergency Operations Simulation (tabletop) exercise. However, full field exercises involving a variety of actual communities will be regularly conducted as well.

The program implementation effort can be configured in a variety of ways. Basic alternatives consist of: Army support to the process through provision of contractor support; direct financial support to affected jurisdictions; and provision of technical assistance through FEMA or other federal resources.

The selected program implementation approach is similar to the effort chosen for fixed sites. Since fixed sites at the points of departure and destination are an integral part of the rail transportation emergency

planning concept, it is appropriate that the implementation process be configured in the same way. The federal government will provide direct financial assistance to affected states for the retention of professional emergency preparedness staff. The Army will retain contractors to oversee the implementation process, ensure compliance with program standards, and maintain schedules. The Army will also employ contractor assistance in the development of its escort emergency preparedness capability.

### 3.3.2 Limited Collocation Option - Air Transportation

#### 3.3.2.1 Introduction

The Army has determined that movement of the entire chemical munition stockpile by aircraft is probably not feasible because the airlift resources required would not be available from the U.S. Air Force. Therefore, only two locations are currently under study for air shipment of munitions. These are Lexington-Blue Grass Army Depot, Kentucky, with about 2 percent of the stockpile by agent weight, and Aberdeen Proving Ground, Maryland, with 5 percent of the stockpile by agent weight. The destination will be Tooele Army Depot, South Area, Utah. The two origin sites are being considered because there are substantial population concentrations near the installations. The nearby public has also expressed the desire for the Army to investigate transferring the local stockpile to another installation for destruction. The Army is considering Tooele Army Depot as the only receiving installation because of the low population density in the vicinity of Tooele Army Depot and the difficulty of constructing an airfield at Anniston Army Depot.

Transport of chemical munitions by aircraft would be accomplished by loading the sealed munitions containers onto U.S. Air Force C-141 or C-5 transport planes. The munitions containers will require no handling or opening during a flight. However, emergency landing sites will be designated along the route for handling containers if needed in an emergency. Special operating procedures will be developed for the airlift mission.

The airlift of the chemical agents and munitions will be carried out by the U.S. Air Force Military Airlift Command as a Special Assignment Airlift Mission. As part of this process, the Army and the Air Force will develop a Mission Operating Directive delineating the operating requirements and procedures to be followed in the airlift operation. Because of the hazard of the cargo, these operating requirements and procedures will be more stringent than standard airlift operating procedures of the Military Airlift

Command. Procedures developed for airlift of nuclear cargo will be used as a model for development of the Directive.

Specific flight routes will be selected before an aircraft transportation program is implemented. Routes will be as direct as possible, but aircraft will not fly directly over densely populated areas. Government-controlled facilities for landing the munitions aircraft will be needed along the route should an emergency arise in flight. The airfields and facilities will met Air Force standards for the type of aircraft used. In addition, the airfields will meet the following requirements to the extent possible:

- Low population density around the site.
- U.S. Air Force installation (preferable) or other federal property.
- Straight-in approach for at least three miles with no significant obstructions.
- Runways at least 150 feet wide.
- Planned crash rescue, medical, security, and emergency response procedures.
- Medical support facilities and trained medical personnel on-site or nearby.
- Container handling and decontamination equipment on-site.
- Direct communications with the central Army Command and Control Office.

Should a munitions aircraft be required to land at a designated emergency landing site due to a detection of agent leakage by on board monitors, the downwind hazard distance will be calculated using computer dispersion

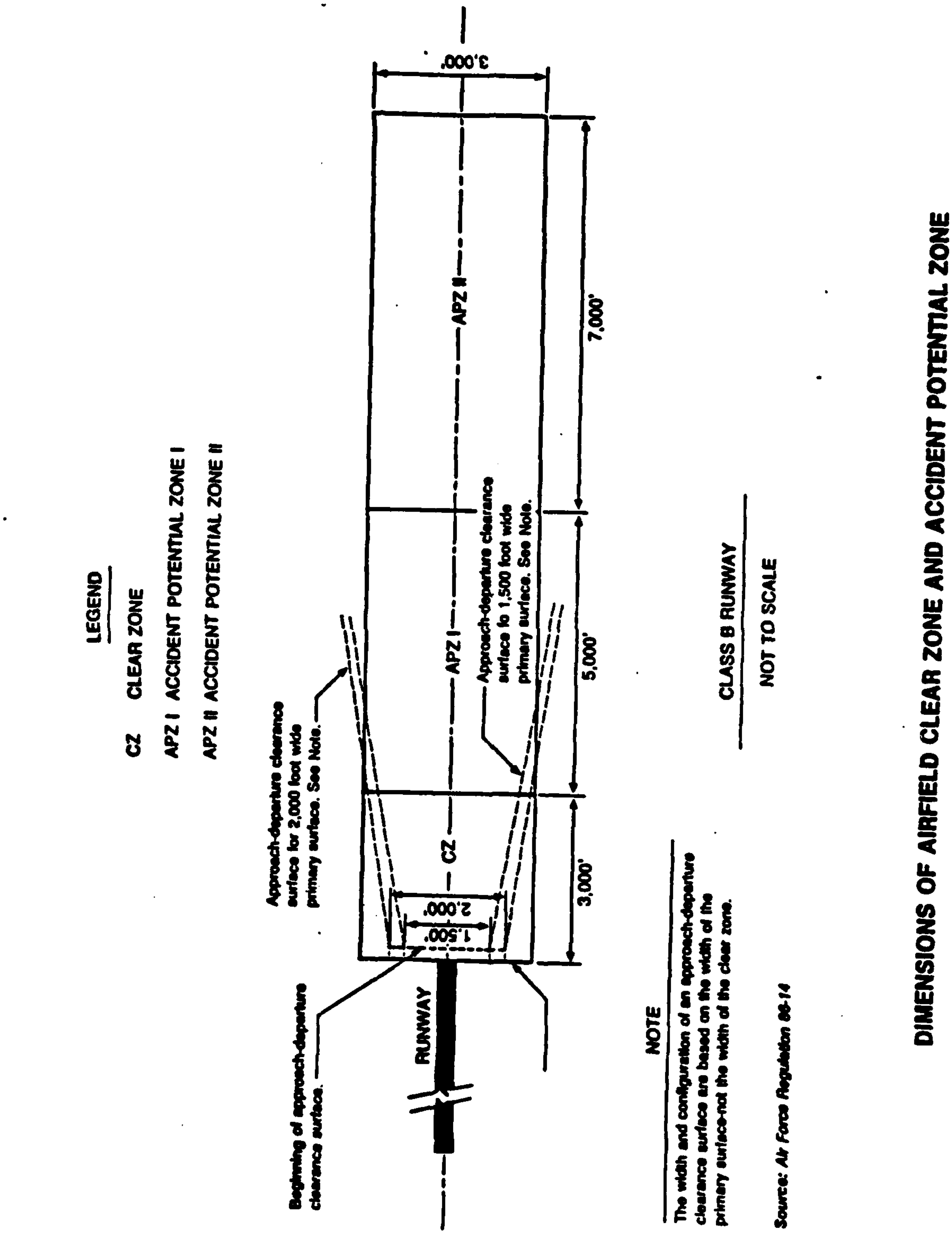
modeling and on-site meteorological data. Field monitoring teams will be deployed within the downwind hazard area while the aircraft is at the landing site.

Airfields must be constructed at Lexington-Blue Grass Army Depot, Aberdeen Proving Ground, and Tooele Army Depot for an air transportation program. New airfields constructed must meet Air Force standards as specified in Air Force Regulation 86-14. These new airfields will have runways 200 feet wide. A precision approach will be used, which requires a 5-mile straight-in approach path.

There is a requirement for a clear zone and two accident potential zones at the end of each runway (Figure 3-1). As defined in Air Force Regulation 86-14, the Accident Potential Zone I is the area that poses a significant potential for accidents and the Accident Potential Zone II is the area that has a measurable potential for accidents. Land use in these zones is restricted as specified in Air Force Regulation 19-9. The clear zone must also meet minimum grading and clearance requirements (Air Force Regulation 86-14). It is desirable that the accident potential zones be government-owned so that land use can be completely controlled.

An approach-departure clearance zone also is required. This zone extends 50,000 feet from the end of the runway. Heights of structures within this zone are restricted.

FIGURE 3-1




Source: Draft Transportation Concept Plan, MITRE Corporation 1987

### 3.3.2.2 Discussion and Alternatives

A basic assumption regarding emergency preparedness for all aircraft operations is that minimal risk is presented when an aircraft is not in an approach or departure mode. This assumption will be applied to emergency response considerations for the chemical stockpile disposal program as well. Indeed, the additional in-flight precautions called for in transportation plans will further reduce such a risk.

It is conceivable that emergency planning could be initiated for all potentially affected jurisdictions within an air corridor. As is the case with the rail transportation option, however, there are a number of factors (number of jurisdictions, the need to finalize routes in advance) which render such a process impractical. Consequently, the emergency preparedness program for the air transportation option addresses the fixed sites (storage/loading points, landing/unloading points and emergency landing sites) involved with the air transportation option.

In addition, planning will be conducted for those areas which are located within the approach and departure accident potential zones and clear zones for all fixed sites. Such areas extend to the maximum accident potential zone distance of 15,000 feet on either end of all active runways. Thus, the emergency response planning zones are not generated as radii around a fixed point but are based on the concept that a point source accident can occur at any point within the accident potential zones or clear zones. A detailed discussion of the air transportation emergency planning zone concept is provided in Section 1.4.

With this exception, emergency preparedness activities will be conducted as discussed in Section 3.1 for fixed storage/disposal sites.

The primary benefit which will be realized is the provision of a comprehensive emergency preparedness program for those areas which are exposed to a significant risk from the air transportation program, i.e., the origin and destination site areas and emergency landing site areas.

### 3.3.3 Limited Collocation Option - Water Transportation

#### 3.3.3.1 Introduction

This section identifies and discusses emergency preparedness issues related to the shipment of the bulk mustard agent inventory at Aberdeen Proving Ground, Maryland, to Johnston Atoll in the Pacific Ocean.

#### 3.3.3.2 Discussion

Movement of the inventory of ton containers of mustard agent from Aberdeen Proving Ground, Maryland, to Johnston Island would be accomplished using the LASH shipping system (Lighter Aboard SHip). In this system, barges (called lighters) are loaded with cargo at shore facilities and towed to the LASH vessel. The loaded lighters are lifted aboard the LASH vessel with a shipboard crane and stored in the hold. The LASH vessel proceeds to the destination. The lighters are placed in the water using the LASH vessel crane, towed to a shore facility and the cargo unloaded.

For the movement of the mustard inventory at Aberdeen Proving Ground, a LASH ship will be taken from the U.S. Navy Ready Reserve Fleet, prepared for the voyage, and a civilian Merchant Marine crew hired to operate the vessel. The ton containers of mustard agent will be placed in vaults, and the vaults will be loaded onto the lighters at an Army facility constructed on Army property on the Bush River. (Figure 3-2) Groups of loaded lighters will be assembled, towed to the LASH vessel anchored nearby in the deeper water of the Chesapeake Bay, lifted aboard the vessel and stowed in the hold. Only one shipload is required to transport the mustard inventory.

Upon completion of loading, the LASH vessel will proceed to Johnston Island along the route shown in Figure 3-3. This route has been chosen to maintain helicopter access to the ship for as much of the voyage as possible. The Panama Canal will not be used because of the problem of maintaining adequate vessel security in the confined area of the canal. A Coast Guard

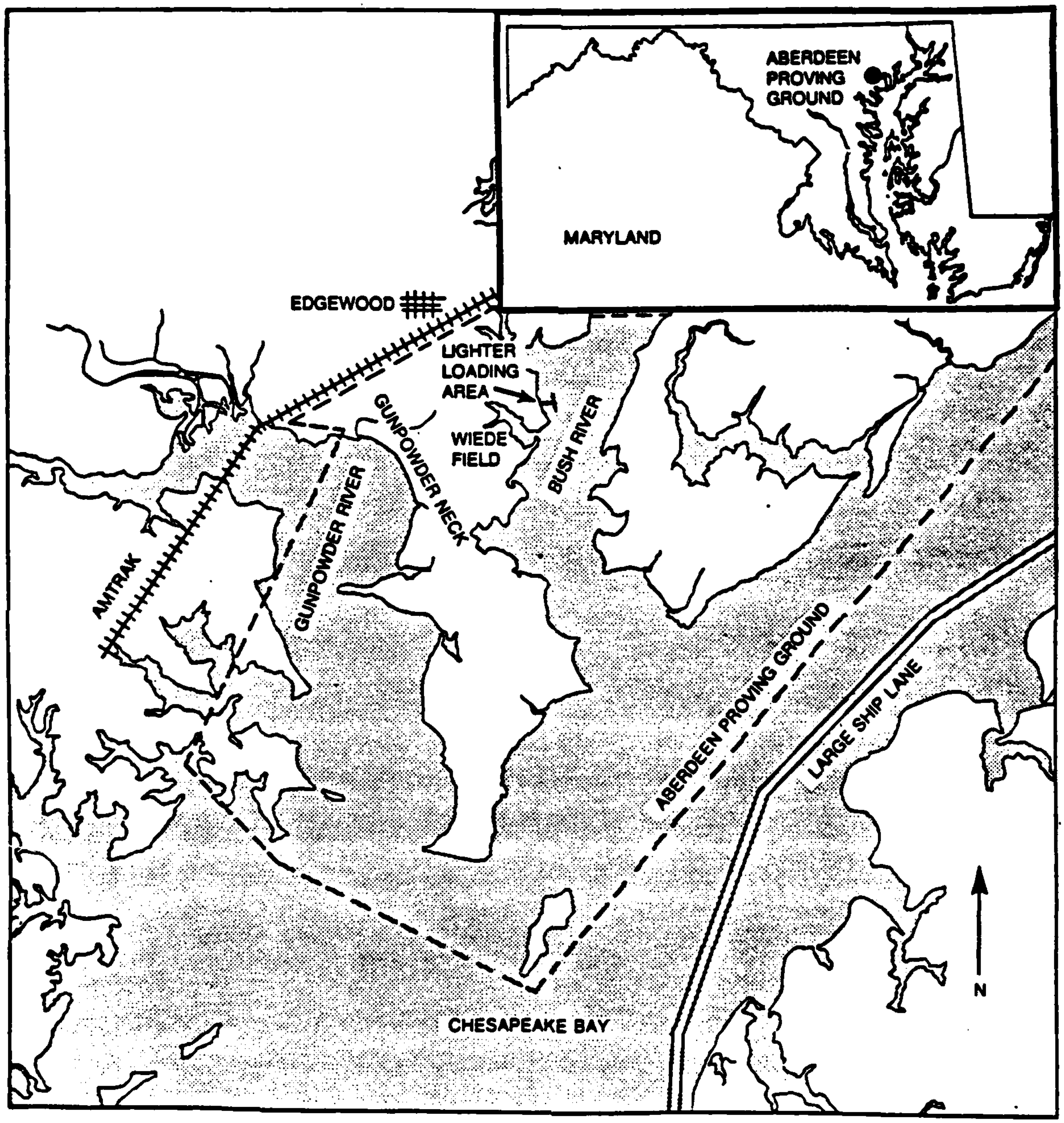



FIGURE 3-2

**PROPOSED LOCATION OF LIGHTER LOADING AREA AT ABERDEEN PROVING GROUND, MARYLAND**

Source: Draft Transportation Concept Plan, MITRE Corporation 1987

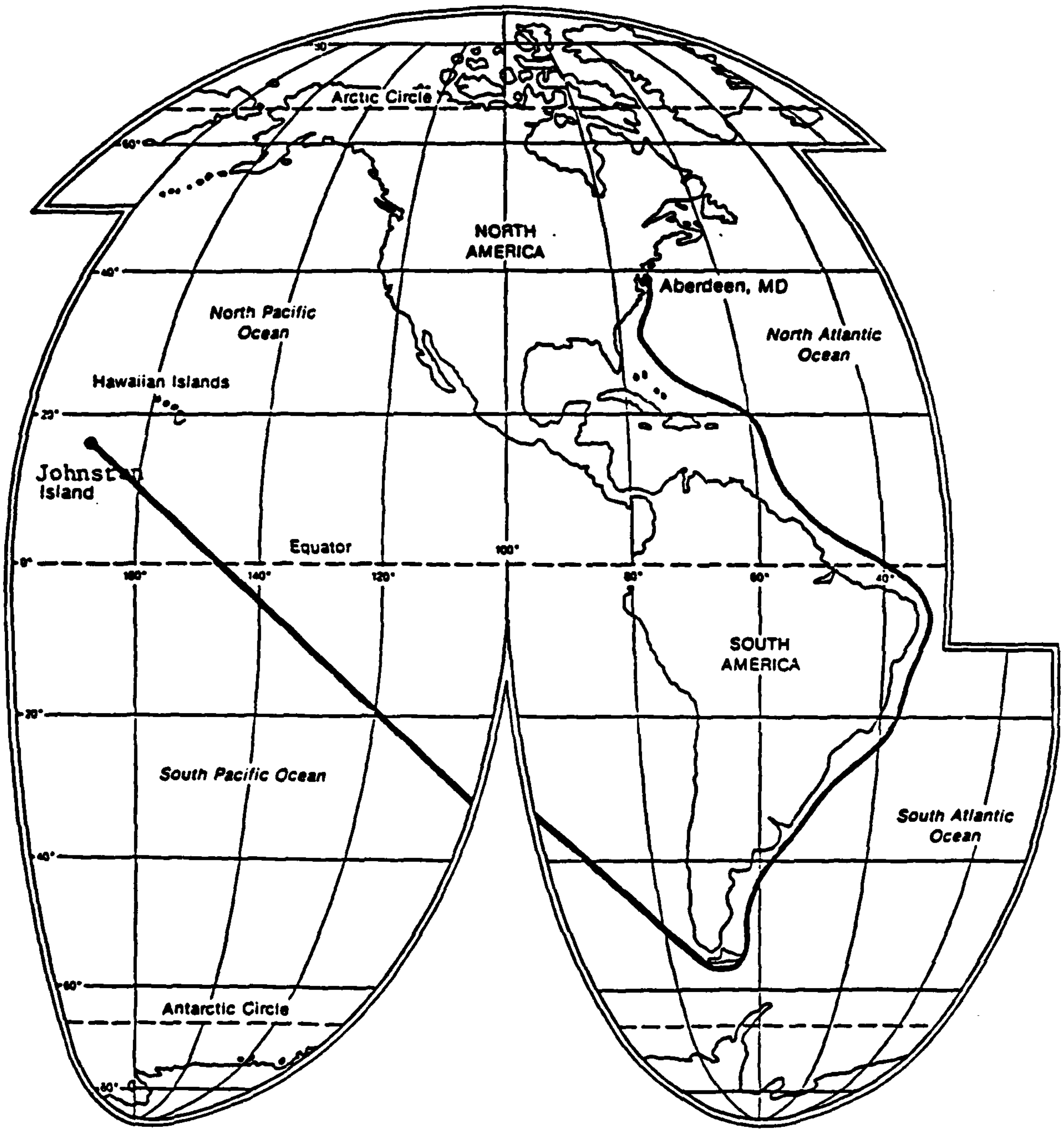



FIGURE 3-3

ROUTE OF THE LASH VESSEL FROM
ABERDEEN PROVING GROUND, MARYLAND TO
JOHNSTON ISLAND

Source: Draft Transportation Concept Plan,
MITRE Corporation 1987

vessel will also accompany the convoy in the Chesapeake Bay for security and safety. The U.S. Navy will be responsible for security for the ocean part of the voyage beginning at the mouth of the Chesapeake Bay. The method for providing this security will be determined from the results of a vulnerability assessment to be undertaken by the Army. These escort vessels will contain additional technical escort personnel sufficient to respond to an emergency aboard the LASH vessel that cannot be handled by onboard medical and escort personnel.

### 3.3.3.3 Alternatives

Significant portions of this route affect a relatively confined and heavily populated area adjacent to the Chesapeake Bay. The in-transit phases of this option which occur within the Chesapeake Bay can thus be considered as variations of a fixed site response. That is, the areas which will be exposed to a significant hazard are relatively well-defined, which is not the case for the rail or air transportation corridors at this time. In addition, the Chesapeake Bay area, which would be most directly affected by an accident, is not so large that detailed emergency planning could not practically be conducted for the affected jurisdictions. Ten counties and two major cities in Maryland, and four counties and two major cities in Virginia, could be directly affected by an accident within the Bay. Consequently, the concept of full scale emergency planning for these areas appears to be viable.

Another potentially viable concept would address the development of a land and air-based escort emergency preparedness program to supplement the planned Coast Guard escort while in the Chesapeake. Such an escort group would be able to provide a number of necessary activities including public alerting, monitoring and decontamination of off-site areas, traffic and access control, and accident assessment. Since the water transportation option is a one-time-only movement, such an escort capability could be supplemented by a lower level of effort preparedness program for the affected jurisdictions.

Once the LASH ship leaves the Chesapeake Bay and enters the Atlantic Ocean, current plans call for the ship to remain far enough at sea to eliminate immediate danger to land areas. However, there are several implications specific to this concept which require further exploration. Some potential exists for an accident at sea to result in contamination of waterfront land areas with the mustard agent. Plans can be developed for the notification of all jurisdictions along the route in the event of an accident, and some provision for access control of affected areas, and decontamination, can be made. The sinking of the LASH ship at sea could result in potentially severe ecological impacts. However, such impacts, which do not present immediate direct hazards to human populations, are beyond the scope of this plan.

The benefit to be derived from implementing a full emergency preparedness effort in all potentially affected inland jurisdictions is the same as the summary of benefits related to fixed site recommendations: a very high level of response with a capability to rapidly implement protective actions for the population at risk.

The alternative approach, which couples a land and water-based response program with a more limited planning effort for state and local jurisdictions, would likely provide a nearly equivalent level of protection.

3.3.3.4 Conclusions

The most significant risks of direct exposure to human populations from this alternative are posed during the loading operation and the Chesapeake Bay portion of the in-transit phase. The number of jurisdictions affected by these activities is limited, thus increasing the feasibility of full scale community-based emergency planning.

However, the limited potential for catastrophic events in transporting bulk containers of mustard, coupled with the fact that only one shipload of mustard agent will ever be moved, indicates that such a level of effort is excessive. Consequently, the Army will develop a land and air-based escort

emergency response capability for this one-time movement, coupled with a limited planning effort for potentially affected jurisdictions.

Once the LASH vessel emerges into open water, emergency preparedness measures for civilian areas along the route will be limited to notification of accidents, provisions for control of access to affected shorelines, decontamination of affected shorelines, and response to ecological impacts.

## APPENDIX A
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# APPENDIX B
# DEFINITIONS

1. Access Control Point - A location which is manned to deny the entry of unauthorized personnel into an area of risk. Access control is normally performed just outside of the risk area and is an enforcement function involving the deployment of vehicles, barricades or use of other measures to deny access to a particular area.

2. Acute Toxicity - Single or multiple exposures over 24 hours or less to high concentrations, eliciting a toxic effect.

3. Carcinogenic - Having the ability to produce malignant tumors.

4. Chemical Agent - A compound or material included in the lethal stockpile of a variety of munitions and bulk containers covered by Public Law 99-145, Title 14, Part B, Section 1412. Lethal chemical agents are of two basic types: nerve and blister.

5. Chronic Toxicity - Long duration, low concentration exposure which results in a toxic effect.

6. Conservative Most Likely (CML) Conditions - The set of meteorological conditions that generally reflect average transport and diffusion conditions.

7. Delayed Neuropathy - Disease of peripheral nerves which may follow recovery from poisoning with some organophosphate compounds.

8. D2PC - A dispersion model developed to estimate downwind hazard distances from releases of chemical agents.

9. Emergency Broadcast System (EBS) - A federally established network of commercial radio stations that provide official emergency instructions or directions to the public during an emergency. Priorities for EBS activation and use are: first, Federal government; second, local government; and third, State government.

10. Emergency Operations Center (EOC) - A facility designated as the location where responsible officials gather during an emergency to direct and coordinate emergency operations. Communications with other jurisdictions and with emergency forces in the field, formulation of protective action decisions, and the development of information and instructions for public dissemination are also functions of the EOC.

11. Emergency Planning Zone (EPZ) - A geographical area delineated around a potential hazard generator that defines the potential area of impact in order to facilitate planning for the protection of people during an emergency occurrence.

12. Evacuation - A protective action which involves leaving an area of risk until the hazard has passed.

13. Institutional Populations - People in schools, hospitals, nursing homes, prisons, or other facilities that require special care or other considerations by virtue of their dependency on others for appropriate protection .

14. Mass Care Center - A facility for providing emergency lodging and care for persons made temporarily homeless by an emergency. Essential basic services (feeding, family reunification, etc.) are also provided at or near the mass care center.

15. Mutagenic - Having the ability to produce an inheritable change in genetic material.

16. Population at Risk (PAR) - The population that could possibly be affected by concentrations of agent above the no-deaths levels. The PAR is calculated by determining the population within the radial distance estimated to be affected by lethal dosages of agent for a release.

17. Protective Action - An action or measure taken to avoid or reduce exposure to a hazard.

18. Protection Factor (pf) - The measure of exposure reduction provided by a protective device or shelter. A pf of 100 means that the exposure is 1/100th of unprotected exposure.

19. Public Alert/Notification System - The system for obtaining the attention of the public and providing appropriate emergency information. Sirens are the most commonly used public alert devices but frequently are supplemented by alert radios, visual warning devices for the hearing impaired, and telephone based alert/notification systems. Emergency instructions are most commonly provided through activation of the Emergency Broadcast System (EBS).

20. Route Alerting - Normally a supplement to the public alert system, this is a method for alerting people in areas not covered by the primary system or in the event of failure of the system. Route alerting is accomplished by emergency personnel in vehicles travelling along assigned roads and delivering emergency instructions with public address systems or by door-to-door notification.

21. Sheltering - A protective action which involves taking cover in a building that can be made relatively airtight. Generally, any building suitable for winter habitation will provide some protection with windows and doors closed and heating, ventilation, and air conditioning

systems turned off. Increased effectiveness can be obtained in sheltering by methods such as using an interior room or basement, taping doors and windows, and other more elaborate systems to limit natural ventilation.

22. Systemic Effect - Toxic effect to the entire body.

23. Teratogenic - Having the ability to produce physical defects in offspring.

24. Traffic Control Point - A location which is manned to ensure the continued movement of traffic inside or outside an area of risk. Traffic control is a temporary function to be implemented at points where normal traffic controls are inadequate or where redirection of traffic becomes necessary due to emergency conditions.

25. Worst Case (WC) Conditions - The set of meteorological conditions that result in maximum predicted downwind distance to the no-deaths dosage for the accidents evaluated.

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